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AMERICAN
DYESTUFF REPORTER
DEVOTED TO TEXTILE WET-PROCESSING

contents

VOLUME 46 January 28, 1957 NUMBER 2

aatcc proceedings

feature article

1956 Intersectional Contest:—
Cationic Softeners—Their Secondary Effects on Textile Fabrics P41
Philadelphia Section
Applications of Sonic Techniques in the Textile Industry P58
Miguel G Junger

miscellaneous

Membership Applications P59
Minutes—190th Meeting, Technical Committee on Research P60
AATCC Calendar P63
Derby Appointed AATCC Treasurer P64
Important Announcement to Those Desiring the Second Edition of the *Colour Index* ... P65
Employment Register P65
Future Papers P65
Activities of the Local Sections P66
Organization of the AATCC P68

departments

News of the Trade 69
General Calendar 70
New Products and Developments 71
Names in the News 77
Technical Literature 77

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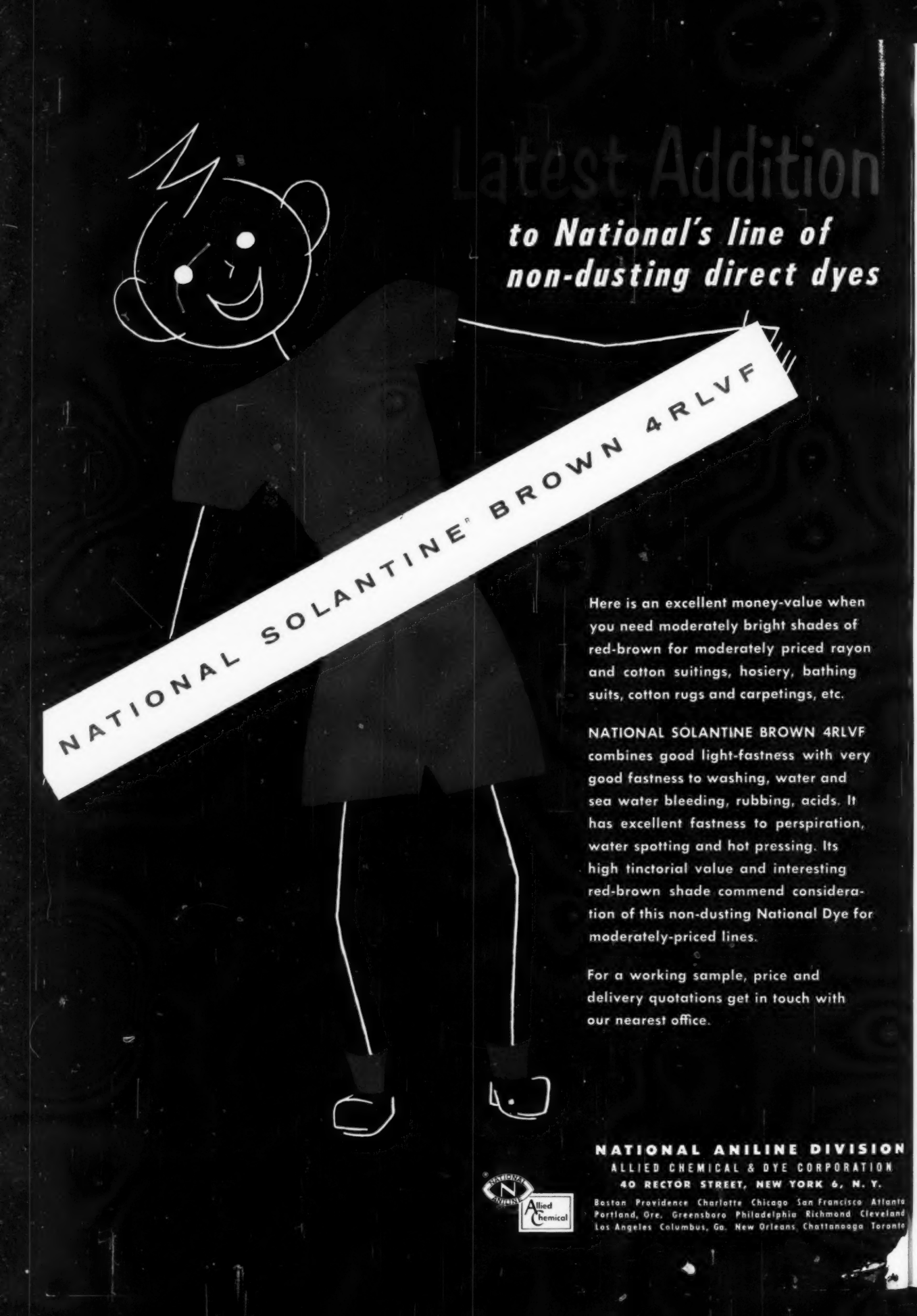
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JANUARY 28, 1957

1956 Intersectional Contest———

CATIONIC SOFTENERS—THEIR SECONDARY EFFECTS ON TEXTILE FABRICS*

PHILADELPHIA SECTION

The final finishing of textile fabrics, whether chemical or mechanical in nature, is of major importance in their manufacture and acceptability. Cationic softeners frequently play an important role in the various chemical finishing treatments which are applied to fabrics.

A considerable amount of data has been published and many claims made on the usefulness of cation-active materials as germicides, water repellents, direct dye fixatives, and softeners. However, relatively little, if any, data is available on the effect of cationic softeners on secondary fabric properties.

For this study nine cationic softeners were chosen after thorough investigation to insure that they represented the various known and commercially available types of quaternaries, amine, amide and imidazoline derivatives. A relatively new nonionic type has been included for comparison and to obtain further basic information.

Both pad and substantive application at two concentrations was considered, but the former method was adopted for the bulk of the work. The softeners were applied by accepted procedures to Acrilan, Arnel, cotton, nylon, rayon and wool fabrics under mill conditions. An attempt was made to determine relative differences between softener types on such fabric properties as tear strength, seam strength, electrical resistivity, aging, heat, and color change resulting from the latter two and ultraviolet light.

Results of these tests as related to the various individual fabrics are discussed and data presented in tables and graphs.

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INTRODUCTION

THE final finishing of textile fabrics, whether chemical or mechanical in nature, is of major importance in their manufacture and acceptability. Surface-active agents frequently play an indispensable role in the various chemical finishing treatments which are applied to fabrics. One of the most widely used final operations consists of or includes the application of a "softening agent" to improve the hand, drape, and cutting and sewing properties of a fabric. These agents are essentially lubricants of high spreading and penetrating power and are generally divided into two classes—the nonsubstantive types, which for the most part are anionic or nonionic in nature, and the substantive softeners, which are based on cation-active compounds.

Cationic surfactants have been described as materials which dissolve or disperse in water, concentrate and orient at interfaces, and ionize in such a way that the cation includes a hydrocarbon chain which is hydrophobic and contains from 8 to 25 carbon atoms. They were first introduced to the textile industry in the United States about 25 years ago. Hundreds of them are described in the patent literature but relatively few are commercially available. The commonly used types are sufficiently varied in constitution and properties to make generalization difficult since they differ in respect to concentration, solubility, compatibility and catonic behavior.

In addition to being efficient softening agents, many of these cationic materials are used widely for other purposes in which their lubricating

* Presented by William S Sollenberger on September 15, 1956 during the Perkin Centennial celebration at the Waldorf Astoria, New York, NY

properties are of minor importance. As germicides, fungicides, and disinfectants, quaternary ammonium compounds of varied hydrophobic structures have demonstrated their ability to kill microorganisms. In addition, several of the more widely used permanent water repellent treatments are derived from cationic surface-active agents. Fabrics so treated are cured after application and drying, pyridine is evolved, and probably the hydrophobic group present in the original molecule is separated from its solubilizing group to form a truly hydrophobic substance on the fiber surfaces (*1*).

Another important use of certain cationic types in textile operations is as an aftertreatment of direct dyes to improve water fastness. This treatment results in the formation on the fabric of an insoluble salt of the long-chain cation with the large dyestuff anion, and "bleeding" in water is thereby minimized. When used in conjunction with direct dyestuffs, all cationics, whether applied for germicidal purposes, water repellency, improvement of wet fastness or softening, have a detrimental effect on light fastness of this type of dye. In 1941 the Rhode Island Section of the AATCC (*2*) presented a study of this effect. Ackley (*3*) also pointed out that the effect of cationic materials on light fastness was largely dependent on the amount of cationic present on the fabric, the temperature of application, and the time of exposure to the cation-containing bath. Additionally, direct dyeings in pastel shades are frequently seriously affected—pinks may develop a yellow cast while some blues may become redder.

Even with these apparently serious disadvantages, the cationic surfactants have found widespread use as lubricants and softeners for cellulosic fabrics. Their importance has been increased by the advent of the several hydrophobic fibers in the past eight years, not only because of their excellent softening characteristics but also because of the need by these fibers for an antistatic finish. There is a natural tendency to use high concentrations of cationic materials to obtain improved softness. Since most of these substances are, in the pure form, somewhat solid, tacky waxes, large concentrations applied to fabrics may result in actual stiffening effects. Finish baths containing less than 0.5% of active material seldom produce such stiffening. As the concentration is increased up to this point, surface smoothness usually increases accordingly, but very high concentrations may produce a tacky surface. Relatively high amounts, depending on fabric construction and composition of the cationic material, may produce effects varying from silky to suedy. The use of unusually high concentrations (of approximately 2.0% of active ingredient) has been known, however, to produce an extremely soft nap on some knitted fabrics.

As with other types of finishing agents, there are two principal methods of application of cationic softeners:—

1) Exhaustion from dilute baths.
2) Padding from relatively concentrated solutions.

The "long bath" or exhaustion procedure is especially suitable because of the natural substantivity of these materials and is usually adopted for knit goods and other fabrics not requiring resin treatment. When thermosetting resins are applied, cationic lubricants are a valuable adjunct to the treatment, since they are not appreciably removed in the afterwashing operation and serve to reduce needle cutting during garment manufacture and generally impart improved tear and abrasion resistance to the finished garment.

Thus far we have discussed very briefly the uses and recognized advantages and disadvantages of cationic lubricants. Much has been written about their softening capabilities and their effect on dyestuff shade and light fastness, but in searching the technical literature thoroughly, we have failed to find a single publication in which the effect of these materials on fiber or fabric physical properties has been studied or discussed. The need for information of this nature was pointed up recently in the recommendations of the AATCC's National Advisory Research Committee to the Executive Committee on Research.

This paper concerns work done in an attempt to determine these effects, particularly on such secondary effects as fabric tear strength, seam efficiency, electrical resistivity, aging, heat, and color change by ultraviolet light.

In the selection of materials for study, all cationic and/or substantive softeners listed in the *1954 Technical Manual and Year Book of the AATCC* were catalogued and their composition studied. These materials represent various chemical types as follows: quaternary nitrogen compounds, amine salts, amido derivatives and materials with acidic as well as basic groups; ie, the amphoterics and materials with nonionic solubilizing groups in addition to the basic nitrogen groups.

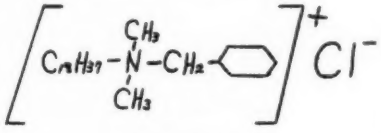
The selection of ten softeners from this list was governed by the following considerations.

1) The materials must represent the important types of cationic softeners.
2) The materials must be commercially available.
3) The composition of the materials and the amount of active ingredients must be known.

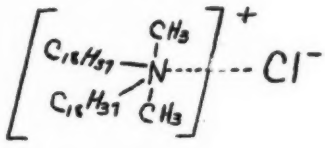
The following tabulation identifies the selected products according to chemical classification, chemical name or description, and as far as possible, structural formula.

QUATERNARIES:—

A) Straight quaternaries with no other hydrophilic groups



Product 1
Octadecyl-dimethyl-benzyl-ammonium chloride



Product 2
Dimethyl distearyl quaternary ammonium chloride

B) *Quaternaries with amido groups*

(The name given does not permit the writing of a structural formula. It is believed that the chemical belongs under this heading.)

Product 3
Diethyl amino ethanol-stearamide-ethyl sulfate

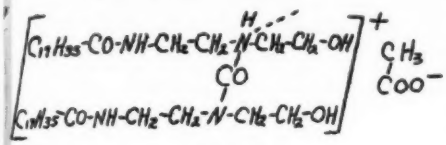
Product 4
Stearamido methyl pyridinium chloride

AMINE HYDROCHLORIDE:—

(Epichorhydrin being bifunctional can react in two ways, depending on the pH, proportion of reactants, etc. While no structural formula can be assigned, the product no doubt contains secondary or tertiary (or both) amino nitrogen, free and as hydrochloride.)

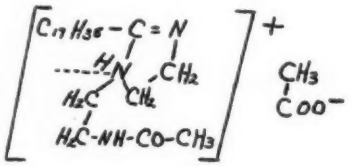
Product 5
Reaction product of epichlorhydrin with octa decyl amine

AMIDO DERIVATIVE:—

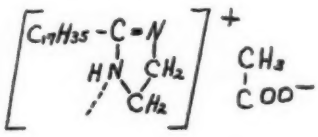


Product 6
U S Pat 2,304,369

IMIDAZOLINE DERIVATIVES:—

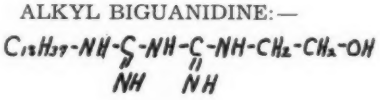


Product 7
N-2 acetamido ethyl C hepta decyl imidazolinium hydro acetate



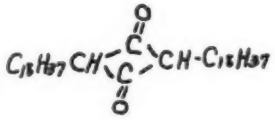
Product 8
Acetate salt of heptadecyl imidazoline

ALKYL BIGUANIDINE:—



Product 9
Alkyl biguanidine

KETENE:—



Product 10
Mixture of long chain alkyl ketene dimers

In some cases, softeners of a given chemical composition are made by several companies and while from the basic synthetic procedure the products should be identical, they may show considerable differences in textile behavior due to minor differences, such as impurities. In these instances the test results have no significance without full identification of the softener. However, for the majority of the products used in this study, the textile chemist will quickly identify the chemical formula with one or more domestic products and it serves no purpose to mention the trade names.

Product 10, although not a cationic, is a relatively new type of softener and was included in the study for comparative purposes as well as to help us obtain further basic information on its textile effects. The list is by no means complete, since it does not include all types of compounds, but it is believed sufficiently varied to give the coverage required for an investigation of this nature.

EXPERIMENTAL

APPLICATION PROCEDURES ——Six fibers were chosen for the study of the effect of the cationic materials. Boiled-off fabrics prepared as for dyeing were obtained in a plain-weave fabric construction of Acrilan, Arnel, cotton, nylon, rayon, and wool[1]. (Appendix A).

Each softener was applied at two concentrations to embody the effective ranges generally suggested by the manufacturers of these products. Application, with the exception of wool, was done by padding with the concentration of pad liquor adjusted for each individual fiber to give an add-on of 0.1% of active ingredient on one portion and 0.5% on the other. The manufacturers' recommendations for aftertreating by curing, scouring, etc, were also followed. With the exception of the nylon and wool fabrics, the application and processing was done on commercial plant equipment.

Pad liquors for the individual softeners were prepared and applied as described below. After the application of softener or after the neutralizing step, all fabrics were frame dried at 220°F to scoured width.

Product 1 was stirred slowly into an equal amount of water at 170°F and diluted to proper concentration for application at 90°F.

Product 2 was heated to 130°F and stirred slowly into 9 parts of water at 160°F until solution was observed to thicken and then thin. An amount of sodium acetate equal to one fifth the product weight was added and stirring was continued for 5 minutes. This dispersion was diluted to padding volume and applied at 100°F.

Product 3 was dissolved in 8 parts of water at 170°F and diluted for padding at 90°F.

Product 4 was pasted with 5 parts of water at 120°F and diluted to padding volume at 100°F. An amount of sodium acetate equal to one third the product weight was added with stirring before padding. Fabrics were frame dried to width at 220°F and cured at 275°F for 3 minutes. After being neutralized in a bath containing 0.5% sodium carbonate (owf), the fabrics were again dried.

Product 5 was dispersed in water at 160°F, diluted to volume and applied at 120°F.

Product 6 was dispersed in 8 parts of water at 160°F and diluted for padding at 130°F.

Product 7 was dispersed in water at 160°F, diluted to volume and applied at 100°F.

Product 8 was dispersed in water at 160°F, diluted to volume and padded at 90°F.

Product 9 was dispersed in water at 160°F, diluted to volume for padding at 110°F.

For Product 10, a 10% dispersion was prepared by adding to water at 140°F with mild agitation, diluted to volume by pouring into water at 120°F and padded at this temperature. Fabrics were frame dried at 220°F to scoured width and cured at 250°F for 5 minutes.

The padding technique was adopted because it is believed that a major portion of these materials is applied in this manner either alone or with resins. Also, this present study is the forerunner of other work to be undertaken by the Philadelphia Section in which the combined resin-softener effect on textile fabrics will be studied and here pad application will be required.

In the case of wool, the softeners were applied from a long bath at active ingredient concentrations of 0.12% and 0.6% at 20:1 volume ratio.

The following time and temperature conditions were used for treatment by the respective agents:

Product
1 — 20 minutes at 120°F
2 — 15 minutes at 100°F
3 — 20 minutes at 100°F
4 — Started at 90°F and raised to 120°F for 20 minutes. Scoured after drying and curing as mentioned above.
5 — 20 minutes at 115°F
6 — 20 minutes at 110°F
7 — 15 minutes at 110°F
8 — 20 minutes at 100°F
9 — 25 minutes at 110°F
10 — 15 minutes at 90°F

Since other studies (4) conducted in the past have indicated possible differences in effects by long bath or substantive-type applications, two of the fabrics, cotton and rayon, were also treated in this manner. This possibility was recognized at the outset of our work, but because of insufficient time and fabric for long bath and pad applications, the latter was adopted for the bulk of the investigations. Product 1, however, was applied to cotton and rayon by the substantive or long-bath method. Applications were made at levels of 2.0%

[1] Twill weave.

and 0.4% on weight of fabric at 40:1 volume ratio, which duplicates padding concentrations used. The product was prepared as described above and added slowly to the bath at 90°F. The bath temperature was raised to 140°F in 15 minutes and maintained at this level for an additional 15 minutes after which the fabrics were squeeze extracted and frame dried to scoured width at 220°F.

TEST PROCEDURES —— The fabrics treated as described above were subsequently subjected to various industry-accepted test methods as a measure of their processing, fabrication, and functional properties. These tests may be described as follows.

Accelerated Aging — CCC-T-191b *Method #5851.* Samples were conditioned at 72°F and 65% RH for 24 hours while suspended in individual open one-quart glass jars. The jars were then sealed and exposed at 175°F ±2° for five days. Both tear strength and color change by spectrophotometer were determined on exposed fabrics.

Highest Processing Temperature. The tendency of some cationic softeners to yellow on heating has been discussed by Swillens (5). He has also suggested possible methods of minimizing this shortcoming by avoiding the incorporation of the "primary and secondary azotized groups in the molecule." For this study, treated samples were exposed at highest temperatures and for times to simulate the average extreme conditions to which a given fabric might be exposed in commercial practice; ie, during heat setting, resin curing, drying, etc. Specific conditions were:—

Acrilan	—	300°F for 5 minutes
Arnel	—	465°F for 30 seconds
Cotton	—	300°F for 5 minutes
Nylon	—	400°F for 15 seconds
Rayon	—	300°F for 7 minutes
Wool	—	275°F for 5 minutes

The samples subjected to these conditions were subsequently tested for changes in tear strength and by spectrophotometric means for changes in color.

Tear Strength. The Pendulum Method #5132, CCC-T-191b, commonly referred to as Elmendorf Tear Test, was used on all fabrics except the nylon. Because of this fabric's construction and high strength, the Tongue Tear Method #5134, CCC-T-191b was used.

Ultraviolet Exposure. Samples were exposed under standard Fade-Ometer conditions of 110° F ambient temperature and 160°F black panel temperature. They were examined after 5, 10, 20, and 40 standard fading hours and any color changes visually apparent after these exposure periods were measured spectrophotometrically.

Measurement of Color Changes. Color changes resulting from treatment of the fabrics with the various softeners as well as those resulting from exposure of the treated fabrics to accelerated aging, heating, and ultraviolet light were determined by use of a General Electric recording spectrophotometer. A very simple method of reporting relative color difference or yellowing was adopted. The degree of change is expressed as the number of ordinate scale units between the control fabric curve and that of the treated fabric when read at the 400 millimicron end of the curve.

It has been proven previously by one of the cooperating laboratories and substantiated by this work that the following rating system is valid and correlates well with human eye observation. Thus, a difference of

1 scale unit	=	trace of change
2 scale units	=	noticeable change
3 scale units	=	appreciable change
4 scale units	=	considerable change
5 scale units	=	very much change.

To illustrate, Figure 1 shows the spectrophotometric curves obtained by accelerated aging of untreated wool fabric and fabric treated with Product 9. In reading the 400 mμ end of the curve, the percent reflectance for the untreated fabric (A) is found to be 39.5%, while the 0.1% application (B) of Product 9 gives 38.0%, and the 0.5% application (C) gives 33.5% reflectance. Thus the reflectance difference between the untreated fabric and the 0.1% application is 1.5%, which indicates trace yellowing, and the 6.0% difference from untreated to 0.5% application is considered very much yellowing.

In reviewing the tabulations in the following sections, it will be noted that many values are in excess of 5. This, of course, indicates rather severe yellowing proportional to the magnitude of this figure.

Electrical Resistivity. The method used for this determination was essentially that described in AATCC Tentative Test Method 76-54. Since static problems are not normally encountered in finished cellulosic fabrics, this determination was made only on Acrilan, Arnel, nylon, and wool.

[2] Described in *Am Dyestuff Reptr* **40**, 164-8 (1951).

Resistivity of the Acrilan and nylon fabrics was measured by the Hayek and Chromey Instrument[2] at both 25% and 50% RH. Measurement on the Arnel and wool fabrics was by the Beckman Ultrohmeter[3] at both 40% and 60% RH.

In the tables, results are reported as the logarithm of the resistivity in ohms per square of fabric. The significance of these figures is:—

8.0 – 10.0	=	No static indicated[4]
10.0 – 12.0	=	Borderline static performance
12.0 – 15.0	=	Bad static performance

Softening. The measurement of the effect of finishing agents in the handle of fabrics (6) has been a controversial subject for many years. Numerous attempts have been made to develop instruments which would adequately measure the factors contributing to hand. At the outset of this study an attempt was made to use the Handle-Ometer[4] as a means of evaluating softness but without success. Generally, the Handle-Ometer results obtained by increasing or decreasing the applied concentration of any one product correlate with the hand evaluation, but inter-comparisons of softeners showed poor correlation between the two methods. This, it is felt, is due to the weighting effects of some softeners and the failure of the instrument to adequately recognize surface smoothness, which plays an important role in hand evaluation.

The sensitivity of the human hand as an objective means of determining differences in finish effect has always been recognized, but the opinions of various observers may be inconsistent. The fact that all individuals possess an ability to rate the feel of fabrics has been discussed by Binns (7). In his studies, groups of fabrics were presented to individuals for rating at the same time by comparison of one against another and arrangement in a relative order of softness. Recently, alternative methods involving the judgment of single samples without reference to other fabrics has been studied (8) and found to have merit. The former approach of inter-comparisons by hand was used in this study.

Strength of Seam. Although it was realized that the majority of the fabrics with which the garment trades work contain resin or other type finishes in addition to softeners or lubricants, it was deemed necessary to include a sewing test as part of this study. As mentioned previously, a future study will determine the combined resin-lubricant effect, but this basic information is needed first.

[3] Beckman Instruments, Inc
[4] Thwing-Albert Co

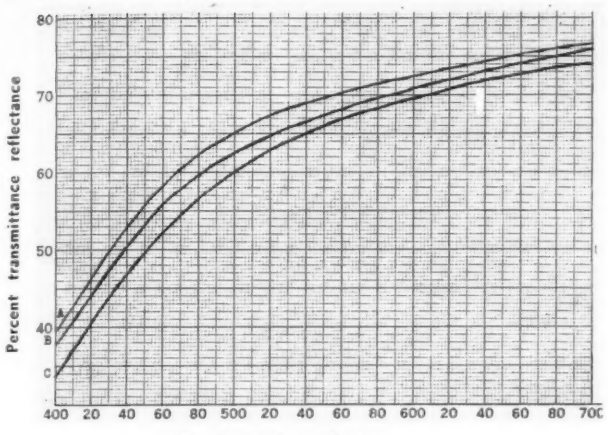


Figure 1
Accelerated aging of
A—Untreated wool fabric
B—0.1% Application of Product 9
C—0.5% Application of Product 9

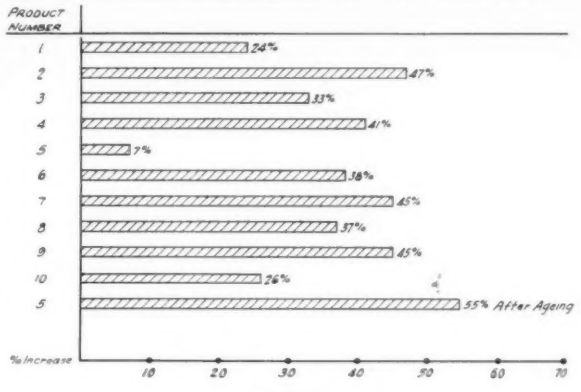


Figure 2
Increase in warp tear strength of Acrilan fabric by 0.1% softener application

The first attempt was to try the Yarn Severance Method #5400 of CCC-T-191b using a Union Special Sewing Machine 51500BJ. A modified test using a Singer 600-W1 machine was also tried; however, both these tests showed little or no yarn severance and so this approach was discarded.

In view of the above, it was decided to use a modified Strength of Seam Test adapted from Method 5110 of CCC-T-191b as follows:

machine	— Singer 600-W1
stitch type	— 301
seam type	— SSa-1
seam allowance	— ½"
needle thread	— 60/3 cotton
bobbin thread	— 60/3 cotton
needle size	— 12
stitches/inch	— 16

Each fabric was sewn in warp direction and comparisons were made of the seam strengths. Ideally, the sewing conditions would be adjusted for each fabric so that the test would cause a fabric tear at the seam. However, in order that some comparison might be made between fabrics as well as within, the above standard procedure was used on all fabrics except the heavy 100% nylon fabric which would have required extremely heavy duty thread in order to approach a seam strength of the same order as the fabric strength.

SIGNIFICANCE OF TEST RESULTS——In order to more accurately ascertain the significance of tear test data, the standard deviation of the untreated control fabrics was determined. To do this, ten tear tests were made on these control fabrics and the standard deviation, s, of this set of numbers calculated by the following equation (9).

$$s^2 = \frac{\Sigma X^2 - n\overline{X}^2}{n - 1}$$

ΣX^2 = the sum of the squared individual test values

n = number of tests

$\overline{X}$ = the sum of the individual test values divided by n

Test results which fall outside of $\pm 2s$ limits have been considered as significant of influence by the particular treatment applied.

DISCUSSION OF RESULTS

Acrilan

EFFECT ON TEAR STRENGTH——All of the softeners in this study produced significant increases in the Acrilan tearing strength when applied at either 0.1% or 0.5% active ingredient. The increases in warp tear strength caused by the softeners ranged from a low of less than 10% with 0.1% Product 5 to the high of 70% with 0.5% Product 4 and Product 2.

Almost without exception, the application of 0.5% softener has a substantially greater effect on tear strength than a 0.1% application. Product 7 produced equivalent warp tear values at both concentrations, but the filling strength is significantly higher at 0.5% concentration.

Rated on the basis of the sum of warp and filling tear strength, Product 2 is the standout performer at the 0.1% level, while all of the other softeners, except Product 5, rank nearly together.

At 0.5% add-on, Product 2 is again rated best, although Product 9 and Product 4 are very nearly as effective. Product 5 shows the least effect, being considerably below the group as a whole. (See Table I.)

At this point, mention should be made of the effect of aging on tear strength. Most of the test results given in the data were obtained within 10 days after application of the softeners. In the case of Product 5, a recheck of the original sample was made after a period of ten weeks. The results after this aging period are significantly higher than the original tests, particularly at the 0.1% level of application. (See Figure 2.)

The effect of aging on the tear strength ratings of the various softeners can be further appraised by comparison of the original values with those obtained after accelerated aging. The control sample showed no significant change in tear strength as a result of accelerated aging. Tear values for the aged samples are still substantially higher than for the control. (See Table I.)

The most interesting observation from the accelerated aging test is the influence on the tear strengths with the various softeners. Applying the standard deviation for significant changes, the tear strengths after aging compare with original tear tests as follows:

Product	0.1%	0.5%
1	+10.0%	−10.0%
2	+ 5.0%	− 7.0%
3	No Change	No Change
4	No Change	− 5.0%
5	+45.0%	+27.0%
6	No Change	No Change
7	−12.0%	No Change
8	+11.0%	+11.0%
9	No Change	No Change
10	+15.0%	No Change

It will be noted that the fabrics treated with Product 5 are very markedly higher in tear strength after aging than originally.

After heat exposure at 300°F for 5 minutes, the fabric treated with

TABLE I
Tear strength data*
(Acrilan)

	Effect of softener 0.1% W	0.1% F	0.5% W	0.5% F	Effect of heat treatment 0.1% W	0.1% F	0.5% W	0.5% F	Effect of accelerated aging 0.1% W	0.5% W
Control	5.8	4.4	5.8	4.4	5.7	5.0	5.7	5.0	5.8	5.8
Product 1	7.2	6.8	9.4	6.9	6.2	4.5	7.9	6.0	8.0	8.4
2	8.5	7.2	9.8	8.6	9.1	6.8	9.6	8.3	8.9	9.1
3	7.7	6.0	8.6	6.2	7.2	5.2	8.3	7.1	8.0	8.6
4	8.2	5.8	9.8	7.5	8.3	7.3	9.6	8.6	8.2	9.3
5	6.2	5.5	6.9	6.6	8.6	7.4	8.8	8.0	9.0	8.8
6	8.0	5.5	9.2	7.5	7.6	6.3	8.5	7.3	8.1	8.9
7	8.4	5.7	8.4	8.2	6.3	5.0	8.6	8.1	7.3	8.6
8	8.0	6.5	8.8	6.7	8.1	7.8	10.1	7.2	8.9	9.8
9	8.4	5.2	9.2	8.8	7.7	6.6	8.7	8.3	8.6	8.9
10	7.3	7.0	8.8	7.3	8.8	7.2	8.9	8.7	8.4	9.1
5**	7.5	6.9	7.5	6.7						

*Average of five tests. Results reported in pounds.
**After 10 weeks aging under standard conditions.

TABLE II
Effectiveness as antistatic agents*
(Acrilan)

		25% RH 0.1%	25% RH 0.5%	50% RH 0.1%	50% RH 0.5%
Control		13.6		13.6	
Product	1	13.0	12.9	12.3	11.3
	2	11.8	11.7	10.5	10.1
	3	11.9	10.6	10.6	9.5
	4	13.6	13.6	13.6	13.6
	5	13.6	13.1	12.6	11.4
	6	13.6	13.6	13.4	12.7
	7	13.6	13.6	13.1	12.1
	8	13.6	12.9	11.8	11.2
	9	12.5	10.9	11.0	9.7
	10	13.5	13.5	13.6	12.8
Untreated cotton		12.7		11.4	

*Expressed as the log of the resistivity in ohms per square of fabric

Product 1 shows a noticeable decrease of approximately 15% in tear strength. The Product 3 and Product 7 treated fabrics show similar decreases although only with the 0.1% applications. The other treated samples either compare favorably with original tests or show changes which are similar to those caused by accelerated aging. (See Table I).

EFFECTIVENESS AS ANTISTATIC AGENTS———Only Products 2, 3, and 9 appear to be of any value as antistatic agents for Acrilan and these are outstanding in this respect. They are effective at both 0.1% and 0.5% application levels with the higher concentration naturally being better. It is interesting to note that two of these materials, Products 2 and 3, are quaternaries. The other quaternary, Product 1, is not nearly as effective on Acrilan although it also offers more resistance than the other cationic types. The Product 1 and 9 treated fabrics were retested in order to confirm the values given. (See Table II).

EFFECT ON FABRIC YELLOWING———There was no apparent color change resulting from application of the softeners to the Acrilan fabric.

However, on exposure to heat at 300°F for 5 minutes, all samples including the control are more yellow than originally. At the 0.1% concentration, treated fabrics are equal to and in most instances less yellow than the control, which indicates that the presence of cationic materials offers Acrilan some protection against yellowing by heat. Products 7 and 8, the imidazoline derivatives, give noticeable improvement in this respect.

At the 0.5% level the protective effect against yellowing is less apparent. Products 1 and 5 are very slightly less yellow than the control while Products 3, 4, and 7 produce a trace of yellowing. (See Table III.)

TABLE III
Effect of heat treatment on yellowing
(Acrilan)

		0.1% R*	0.1% D**	0.1% Change	0.5% R*	0.5% D**	0.5% Change
Control		43.0					
Product	1	44.0	+1.0	Trace	44	+1.0	Trace
	2	44.0	+1.0	"	42.5	0.5	Negligible
	3	43.0	0	None	41.5	1.5	Trace
	4	43.0	0	"	42.0	1.0	"
	5	44.5	+1.5	Trace	44.0	+1.0	"
	6	43.5	+0.5	Negligible	43.5	+0.5	Negligible
	7	45.0	+2.0	Noticeable	41.5	1.5	Trace
	8	45.0	+2.0	"	43.0	0	None
	9	44.0	+1.0	Trace	43.5	+0.5	Negligible
	10	44.0	+1.0	"	43.0	0	None

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; +indicates whitening

TABLE IV
Effect of accelerated aging on yellowing
(Acrilan)

		0.1% R*	0.1% D**	0.1% Change	0.5% R*	0.5% D**	0.5% Change
Control		47.0					
Product	1	48.0	+1.0	trace	48.0	+1.0	trace
	2	47.0	0	none	48.5	+1.5	"
	3	48.0	+1.0	trace	46.0	1.0	"
	4	48.0	+1.0	"	47.5	+0.5	negligible
	5	48.0	+1.0	"	47.5	+0.5	"
	6	48.0	+1.0	"	47.5	+0.5	"
	7	48.0	+1.0	"	45.0	2.0	noticeable
	8	48.0	+1.0	"	48.0	+1.0	trace
	9	47.5	+0.5	negligible	47.5	+0.5	negligible
	10	49.0	+2.0	noticeable	48.5	+1.5	trace

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; +indicates whitening

The results of accelerated aging of fabric containing 0.1% softener are very similar to those of the heat test mentioned above. At this concentration, all treated samples are less yellow than the untreated control. Fabric treated with Product 10 is noticeably less yellow.

While Products 3 and 7 are less yellowed than the untreated at 0.1% level, at the 0.5% level these two materials both promote some yellowing. In the case of Product 7, this is quite noticeable. (See Table IV.)

Samples exposed in the Fade-Ometer were inspected after 5- and 10-hour exposure periods and found to be considerably whitened, but the treated fabrics are all less bleached than the untreated control fabric. Product 4 is noticeably less bleached while all other softeners show only minor changes.

At the 0.5% application level, Product 1 is outstanding in its resistance to fabric bleaching by ultraviolet light. Fabrics treated with Products 2, 3, 4, and 6 are also noticeably less changed. It appears that the quaternaries are particularly good in this respect. (See Table V.)

EFFECTIVENESS FOR SOFTENING FABRIC———Softeners were compared at equal concentration levels only. No attempt was made to compare samples from the 0.5% group with others from the 0.1% group.

TABLE V

Effect of Fade-Ometer exposure on yellowing

(Acrilan)

(10-hour exposures)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		54.5					
Product	1	54.0	0.5	negligible	48.5	6.0	much
	2	53.0	1.5	trace	52.0	2.5	noticeable
	3	53.5	1.0	"	52.5	2.0	"
	4	52.5	2.0	noticeable	52.5	2.0	"
	5	53.5	1.0	trace	54.0	0.5	negligible
	6	54.0	0.5	negligible	52.5	2.0	noticeable
	7	53.5	1.0	trace	53.0	1.5	trace
	8	54.0	0.5	negligible	53.5	1.0	"
	9	54.0	0.5	"	53.0	1.5	"
	10	53.5	1.0	trace	53.5	1.0	"

*Reflectance, percent, at 400 mμ
**Difference in reflectance from control

TABLE VI

Effectiveness for softening fabric

(Acrilan)

		0.1% Panel member						0.5% Panel member					
		1	2	3	4	5	Total	1	2	3	4	5	Total
Control		11	11	11	11	11	55	8	11	10	10	10	49
Product	1	5	9	8	9	7	38	10	7	7	6	6	36
	2	10	10	10	8	3	41	6	9	11	7	11	44
	3	6	6	9	10	10	41	9	8	9	11	5	42
	4	2	4	7	7	4	24	1	2	5	2	4	14
	5	4	1	1	1	1	8	2	1	1	4	2	10
	6	1	5	4	3	5	18	3	5	4	5	7	24
	7	7	3	2	2	6	20	5	3	2	3	1	14
	8	3	2	3	4	2	14	4	4	3	9	9	29
	9	9	8	6	6	8	37	7	10	6	1	3	27
	10	8	7	5	5	9	34	11	6	8	8	8	41

TABLE VIII

Tear strength data*

(Arnel)

	Effect of softener				Effect of heat treatment				Effect of accelerated aging			
	0.1%		0.5%		0.1%		0.5%		0.1%		0.5%	
	W	F	W	F	W	F	W	F	W	F	W	F
Control	4.0	3.3			4.0	3.5			3.9	3.2		
Product 1	3.8	3.5	4.3	3.7	4.3	3.4	4.4	3.9	3.9	3.5	4.3	4.7
2	4.0	3.5	4.3	3.6	4.8	4.0	4.8	3.8	4.2	3.7	5.0	4.1
3	4.9	4.4	4.8	4.1	4.5	3.9	4.5	3.9	3.8	3.5	4.3	3.6
4	3.7	3.3	5.0	4.0	4.3	3.7	5.3	4.5	3.6	3.1	5.0	4.6
5	4.7	3.9	5.0	4.3	4.2	3.4	4.3	3.8	3.7	3.3	4.1	3.5
6	4.3	3.7	4.8	4.1	4.1	3.5	4.5	3.5	3.8	3.1	4.6	3.6
7	4.4	3.7	4.6	3.6	4.0	3.4	4.7	3.9	3.7	3.1	4.4	3.9
8	4.5	4.0	5.0	4.3	4.5	4.1	4.9	4.4	3.9	3.3	4.4	3.9
9	4.7	3.9	4.7	3.9	4.3	3.6	4.8	3.9	4.1	3.4	4.5	4.0
10	4.4	3.5	4.9	4.4	4.4	3.8	5.3	4.3	4.3	3.2	5.3	4.4

*Given in pounds of force required to tear fabric

TABLE VII

Seam strength*

(Acrilan)

		0.1%	0.5%
Control		106	
Product	1	110	109
	2	105	103
	3	102	105
	4	101	107
	5	104	106
	6	98	104
	7	100	101
	8	112	115
	9	104	106
	10	105	103

*Given in pounds

(See Table VI.)

Certain panel members differ sharply in their judgment of the softness of several samples.

At the 0.1% level, Products 5, 8, and 6 are superior in the order mentioned. Products 7 and 4 also rank well, with the other softeners being considered inferior by most judges.

At 0.5% add-on, Products 4, 5, and 7 rank highest; Products 6, 9, and 8 gave an intermediate effect and the other softeners were rated low.

EFFECT ON SEAM STRENGTH ——With the exception of Product 8, which shows significant improvement, the softeners have little or no effect upon seam strength. The test for 0.1% Product 6 is low, but not confirmed by the value at 0.5% concentration. (See Table VII.)

Arnel

EFFECT ON TEAR STRENGTH ——The effect of softener application at the 0.5% level was to generally increase the tear strength of the Arnel fabric. With Products 1, 2, and 7 the increases may be considered insignificant, while fabric treated with Products 3, 4, 5, 6, 8, and 10 show tear strength increases of 20.0 to 25.0%.

At 0.1% concentration, Product 3 gave a slightly better result than at the higher concentration which would rate it among the best of the materials tested in this respect. Products 5, 8, and 9 also produced increases in the range of 17.0 to 18.0%. Changes in tear strength by the other agents were insignificant. (See Table VIII.)

The effect of heat setting on the tear strength of the Arnel fabric is not considered significant on either untreated or treated fabric. Products 4, 8, and 10 retain the increased strength due to 0.5% softener application while Products 3 and 5 show a loss of 8 to 10% which actually might be considered of little consequence. At the 0.1% level, Product 2 shows decided improvement as a result of heat treatment while Products 1, 5, 6, and 7 give correspondingly lower results. (See Table VIII.)

Accelerated aging serves to separate the fabrics treated at the two concentrations; ie, the 0.5% applications give higher tear strengths than the 0.1% concentrations. Within the former group, Products 2, 4, and 10 again give significantly higher tear strengths of 28 to 37% above the untreated aged control. The remainder of the agents effect 12.0 to 14.0% increases.

Products 2 and 10 retain their relative top positions at the 0.1 concentration with tear strength of 7 to 8% above the untreated fabric. All other softeners show insignificant differences. (See Table VIII.)

In considering the above data and that in Table I, it would appear that Product 10, the nonionic softener, is significantly better than most of the cationic materials with respect to retention and improvement of tear strength of Arnel fabrics. Product 2, a quaternary ammonium compound would also appear to be quite acceptable.

EFFECTIVENESS AS ANTISTATIC AGENTS——The results of resistivity measurements indicate that only three of the softeners are effective antistatic agents. These are Products 1, 2, and 3, the quaternary ammonium types when applied at 0.5% concentration. Three of the agents, Products 5, 8, and 9 showed a degree of effectiveness which would class them as borderline. (See Figure 3.)

The 0.1% application of Products 2 and 3 appears to have some slight value while all other softeners applied at this level are ineffective. (See Table IX.)

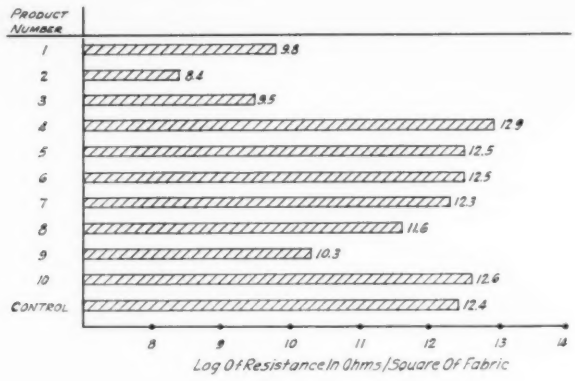


Figure 3
Effectiveness of 0.5% softener as antistatic agents on Arnel fabric at 40% RH

fabric. However, several of the Products applied to the fabric did cause yellowing by this test. Products 3, 6, and 7 resulted in noticeable to appreciable changes at the two concentrations, while the change of fabric treated with Products 8 and 9 was slightly less severe. This effect appears to be dependent on the individual products since results do not indicate good or bad performance for any particular group of cationic agent. Products 4, 5, and 10, as in the aforementioned yellowing tests, appear to be very satisfactory. (See Table XII.)

The effect of Fade-Ometer exposure was to bleach or whiten the untreated Arnel fabric very much. Some of the cationic softeners tend to resist this effect while others such as Products 4, 5, 6, 8, 9, and 10 offer no protection

TABLE IX
Effectiveness as antistatic agents*
(Arnel)

		40% RH		60% RH	
		0.1%	0.5%	0.1%	0.5%
Control		12.4		13.1	
Product	1	12.5	9.8	12.6	10.6
	2	11.1	8.4	11.0	8.4
	3	11.7	9.5	11.6	9.5
	4	12.6	11.6	13.3	12.8
	5	12.5	12.5	12.9	12.5
	6	12.8	12.5	13.3	12.5
	7	12.4	12.3	12.9	12.3
	8	12.6	11.6	13.0	11.3
	9	12.9	10.3	13.1	10.6
	10	12.5	12.6	13.1	12.7

*Expressed as the log of the resistivity in ohms per square of fabric

EFFECT ON FABRIC YELLOWING——The effect of 0.1% application of all softeners was to induce no yellowing, but with one exception a whitening effect is indicated. The color change does not reach more than trace proportions in any instance. This phenomenon is duplicated at the 0.5% level with the exception of fabrics treated with Products 3 and 4 where a trace of yellowing is shown. (See Table X.)

Heat setting causes two products, 1 and 2, to contribute considerable yellowing to the Arnel fabric at the 0.1% application level. All other products give negligible change at this concentration. Product 1 does not give more than a trace of yellowing at the 0.5% level, while fabric treated with Products 2 and 3 show a considerable change. Products 5 and 6 give more, but not objectionable, yellowing at the high than the low concentration, and all other agents remain unchanged. (See Table XI.) It would appear that the quaternary ammonium compounds might be undesirable for application to Arnel fabrics prior to heat setting.

Accelerated aging had no effect on discoloration of the untreated Arnel

TABLE X
Effect of application on yellowing
(Arnel)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		60.5					
Product	1	61.5	+1.0	trace	61.0	+0.5	negligible
	2	62.0	+1.5	"	61.0	+0.5	"
	3	60.5	0	none	59.0	1.5	trace
	4	62.0	+1.5	trace	60.0	0.5	negligible
	5	61.0	+1.0	"	61.0	+0.5	"
	6	61.0	+0.5	negligible	61.0	+0.5	"
	7	61.0	+0.5	"	61.0	+0.5	"
	8	62.0	+1.5	trace	61.0	+0.5	"
	9	62.0	+1.5	"	62.0	+1.5	trace
	10	61.0	+0.5	negligible	62.0	+1.5	"

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; +indicates whitening

TABLE XI
Effect of heat treatment on yellowing
(Arnel)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		60.7					
Product	1	56.5	4.2	considerable	60.0	0.7	negligible
	2	56.0	4.7	"	56.5	4.2	considerable
	3	60.0	0.7	negligible	58.0	2.7	noticeable
	4	61.5	+0.8	"	60.0	0.7	negligible
	5	61.5	+0.8	"	59.5	1.2	trace
	6	61.0	+0.3	"	59.0	1.7	noticeable
	7	60.0	0.7	"	60.0	0.7	negligible
	8	60.0	0.7	"	60.5	0.2	"
	9	61.5	+0.8	"	62.0	+1.3	trace
	10	60.0	0.7	"	60.0	0.7	negligible

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; +indicates whitening

TABLE XII
Effect of accelerated aging on yellowing
(Arnel)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		61.0					
Product	1	60.5	0.5	negligible	59.0	2.0	noticeable
	2	59.5	1.5	trace	60.0	1.0	trace
	3	58.5	2.5	noticeable	57.5	3.5	appreciable
	4	61.0	0	none	60.5	0.5	negligible
	5	60.5	0.5	negligible	60.5	0.5	"
	6	59.0	2.0	noticeable	58.0	3.0	appreciable
	7	57.5	3.5	appreciable	59.0	2.0	noticeable
	8	59.5	1.5	trace	58.5	2.5	"
	9	59.0	2.0	noticeable	59.0	2.0	"
	10	60.0	1.0	trace	60.0	1.0	trace

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control

TABLE XIII

Effect of Fade-Ometer exposure (40 hrs) on yellowing

(Arnel))

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		72.0					
Product	1	71.5	0.5	negligible	70.0	2.0	noticeable
	2	73.1	+1.1	trace	68.5	3.5	appreciable
	3	67.8	4.2	considerable	70.2	1.8	noticeable
	4	72.5	+0.5	negligible	71.3	0.7	trace
	5	72.5	+0.5	"	72.0	0	none
	6	71.6	0.4		72.3	+0.3	negligible
	7	70.0	2.0	noticeable	70.0	2.0	noticeable
	8	73.0	+1.0	trace	72.5	+0.5	negligible
	9	72.0	0	none	72.0	0	none
	10	72.0	0	"	72.0	0	"

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; +indicates whitening

against ultraviolet bleaching. The 0.1% application of Product 3 reduces bleaching considerably while 0.5% applications of Products 1, 2, and 3 show a noticeable to appreciable reduction. Actually these changes appear to be a graying rather than yellowing. Again it appears that the quaternary ammonium compounds offer desirable protection against ultraviolet light bleaching. (See Table XIII.)

EFFECTIVENESS FOR SOFTENING FABRIC———All members of the jury agreed that the 0.1% application of Product 6, and the 0.1% and 0.5% applications of Product 7 gave hands of equal softness and were the softest of all the treated fabrics. Also, it was agreed that 0.5% of Product 4 and of Product 10 gave harsher handle than the control or any other agent. The remaining samples were too nearly alike in softness to be differentiated and relative ratings established. This evaluation indicates that the amido and imidazoline derivatives can impart good softness to Arnel fabrics.

EFFECT ON SEAM STRENGTH———All of the softeners have insignificant effect on the seam strength of the Arnel fabric at the 0.1% level. This is also true of the 0.5 concentrations except that Product 9 appears to increase the strength slightly, whereas, Products 3 and 6 show a slight decrease. (See Table XIV.)

TABLE XIV

Effect on seam strength*

(Arnel)

		0.1%	0.5%
Control		48.0	
Product	1	50.1	47.0
	2	49.1	46.1
	3	46.3	43.7
	4	46.5	47.8
	5	45.9	45.6
	6	49.7	44.3
	7	47.6	47.8
	8	46.4	46.4
	9	49.3	51.9
	10	46.5	45.0

*Given in pounds

Cotton

EFFECT ON TEAR STRENGTH———At the 0.5% application level, practical inspection or statistical considerations show a tear strength gain of about 26% with no differences between the softeners. This is particularly true on the warp yarns where there is only a range of 1.86 to 1.95 pounds for all softeners versus a control of 1.50 pounds. It is quite likely that a leveling-off point has been reached whereby the fabric has achieved the maximum improvement in tear strength available by application of cationic softeners.

On the 0.1% application all showed improvement with some variations which indicates that Product 9 is better than the others. Also Product 7 appears good but chemically similar Product 8 shows no advantage. This same situation exists with Product 3 which appears inefficient while its analogue, Product 4, shows a positive effect. It appears that all of the materials should be considered equal especially since the filling values, in general, contradict these instances.

Application of one softener, Product 1, by exhaustion from a long bath indicates no difference from pad application at 0.5%. At the lower, 0.1% level, the exhausted samples appear definitely improved in the filling only. It may be surmised that the exhaustion technique will deposit softener onto the surface of the yarns and provide yarn to yarn lubrication. By contrast, padding dry fabric under pressure will force softener into all interstices where it provides fiber to fiber lubrication as well as yarn to yarn lubrication. The Elmendorf Tear Test may be more sensitive to the yarn to yarn slippage and thus show an advantage to exhaustion techniques. (See Table XV.)

Upon heating 5 minutes at 300°F a medium resin curing operation is simulated which may be expected to affect the softener and its conferred properties. In general, all softeners show some loss in tear strength due to the heat exposure. The samples showing the greatest loss had originally showed the most gain due to application of softener. The most important data is derived when the heat exposed tear strength is compared with the original fabric strength. Here, Product 9 is the only material at the 0.1% application which maintained a significant improvement over the untreated control fabric; at 0.5% all maintain a significant improvement notwithstanding the slight loss suffered in the heat treatment.

The heat reduced the strength of the untreated control by about 10%. The fabric at 0.1% application shows that Products 2 and 9 have the highest tear strength in the warp; the filling values show no difference. At 0.5% there are no apparent differences among the softeners.

Product 1 applied by exhaustion shows a greater loss due to heat treatment than the padded sample. The original improvement in tear was greatest for the exhaustion which would account for this loss. However, the exhausted samples fall below the padded values. This indicates that the exhaustion technique does not provide so durable improvement as does padding. (See Table XV.)

After 5 days aging at 175°F condi-

TABLE XV

Tear strength data*

(Cotton)

		Effect of softener				Effect of heat treatment				Effect of accelerated aging	
		0.1%		0.5%		0.1%		0.5%		0.1%	0.5%
		W	F	W	F	W	F	W	F	W	W
Control		1.5	0.9			1.4	0.8			1.4	
Product	1	1.6	1.1	1.9	1.3	1.5	0.9	1.8	1.2	1.6	1.8
	2	1.8	1.2	1.9	1.2	1.8	1.0	1.8	1.2	1.8	2.0
	3	1.5	1.1	1.9	1.3	1.4	0.9	1.8	1.2	1.6	1.9
	4	1.7	1.0	1.9	1.1	1.6	1.0	1.7	1.2	1.6	1.9
	5	1.7	1.1	1.9	1.2	1.4	0.9	1.8	1.2	1.7	1.8
	6	1.8	1.0	1.9	1.3	1.6	1.1	1.8	1.1	1.7	1.8
	7	1.9	1.2	1.9	1.4	1.6	1.0	1.8	1.2	1.8	1.9
	8	1.7	1.2	1.9	1.3	1.5	1.1	1.9	1.3	1.6	1.8
	9	1.9	1.1	1.8	1.1	1.7	1.0	2.0	1.4	1.8	1.9
	10	1.7	1.1	1.9	1.3	1.5	0.8	1.9	1.4	1.5	2.0
1 ex	**	1.7		1.9		1.4	0.9	1.6	1.2	1.4	1.7

*Average of five tests. Results reported in pounds.
**Applied by exhaustion.

tioned samples in glass jars showed, in general, slight losses in tear strength over their original unaged values. At the 0.5% level there was no significant loss (—0.2 lbs) which reduced the tear to the original untreated value. (The pH of the aged samples ranged from 6.6 to 7.5; no significant differences here.)

Product 1 applied by exhaustion showed considerable loss over the original treated fabric after aging. In the case of 0.1% the strength was reduced to the original untreated level. At 0.5% the gain, which was originally quite high (+0.44 lbs) is better maintained. Both exhaustion treatments of 0.1 and 0.5% gave higher tears than the pad values on the original unaged samples but heating and aging reversed the situation. This points toward a migration into the yarns. (See Table XV.)

EFFECT ON FABRIC YELLOWING———The effect of application was varied as shown by Table XVI. Application of 0.1% of Products 3 and 7 caused noticeable yellowing while the other agents did not result in significant change at this concentration. At the 0.5% level, however, Product 7 gave much yellowing and Products 8 and 10, noticeable discoloration. Other softeners produced only negligible to trace differences. Products 1, 2, 4, 5, 6, and 9 appear to affect color insignificantly by their application.

Subjecting the treated cotton fabrics to 300°F for 5 minutes to simulate resin curing conditions had no significant yellowing effect on the 0.1% softener applications with one exception. Product 7 did cause appreciable yellowing at this lower concentration and at the 0.5% level, this fabric was very much yellowed. Also at the high concentration Products 6, 8, and 9 resulted in some yellowing and an even greater change of this type was due to treatment with Product 3. (See Table XVII.)

Accelerated aging resulted in some very great discoloration with some softener treatments. Cotton fabrics containing Products 7 and 8, the imidazoline derivatives, were highly yellowed while Products 1 and 3 showed just slightly less yellowing at both application levels. At 0.1%, Products 2, 4, and 6 gave no yellowing and Products 5 and 9 a noticeable to appreciable change. At 0.5% only Products 4 and 5 gave no change while 2 and 10 were noticeable. All others produced more than a 6.0% reflectance decrease from the control which places them in the much yellowed category. (See Table XVIII.)

Fade-Ometer exposure in 10 hour increments up to 40 hours showed no yellowing by Spectrophotometer readings made shortly after exposure. Actually, in almost every case a whitening effect was indicated. (See Table XIX.) However, visual inspection of the samples several weeks later showed equal yellowing of both 0.1 and 0.5% applications as follows:

Appreciable on complete sample — Products 3 and 7
Appreciable in exposed area— Products 5 and 10
Noticeable in exposed area— Products 4, 6, 8 and control
None —Products 1, 2 and 9

It may be concluded that Products 3, 5, 7, and 10 were responsible for the yellowing and that these products are poorer than the others which are equal to or better than the control.

EFFECTIVENESS FOR SOFTENING FABRIC———Three observers showed no correlation when tested by Kendalls (*10*) rank correlation methods. All of the samples showed effective softening with considerable surface "feel" on the 0.5% application. Thus mere evaluation as to softness does not tell the complete story required to produce a raspy, silky or greasy hand. These esthetic effects are best judged when the end use of the fabric is known. Therefore, it is felt that the softness evaluation is a measure of an important parameter not necessarily related to end use.

Since Kendall coefficients were so low, a simple ranking to divide the softeners into three groups was adopted. All groups are close and the listing will only provide a rough measure of

TABLE XVI
Effect of application on yellowing
(Cotton)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		79.6					
Product	1	79.3	0.3	negligible	78.1	1.5	trace
	2	80.5	+0.9	trace	79.5	0.1	negligible
	3	76.8	2.8	noticeable	79.1	0.5	"
	4	80.8	+1.2	trace	80.6	+1.0	trace
	5	80.6	+1.0	"	79.4	0.2	negligible
	6	79.1	0.5	negligible	78.2	1.4	trace
	7	76.9	2.7	noticeable	73.5	6.1	much
	8	78.3	1.3	trace	77.2	2.4	noticeable
	9	79.3	0.3	negligible	78.1	1.5	trace
	10	79.6	'0	none	76.7	2.9	noticeable
1 ex	***	79.3	0.3	negligible	78.1	1.5	trace

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; + indicates whitening
***Applied by exhaustion from long bath

TABLE XVII
Effect of heat treatment on yellowing
(Cotton)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		79.2					
Product	1	79.5	+0.3	none	78.8	0.4	negligible
	2	80.5	+1.3	trace	78.3	0.9	trace
	3	78.1	1.1	"	74.3	4.9	much
	4	80.0	+0.8	negligible	80.1	+0.9	trace
	5	79.7	+0.5	"	78.3	0.9	"
	6	80.0	+0.8	"	77.6	1.6	"
	7	75.7	3.5	appreciable	71.3	7.9	much
	8	79.1	0.1	none	77.0	2.2	noticeable
	9	79.4	+0.2	"	77.5	1.7	trace
	10	80.3	+1.1	trace	79.2	0	none

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; + indicates whitening

TABLE XVIII
Effect of aging on fabric yellowing
(Cotton)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		78.8					
Product	1	72.8	6.0	much	67.0	11.8	much
	2	81.0	+2.2	noticeable	76.5	2.3	noticeable
	3	72.2	6.6	much	65.9	12.9	very much
	4	82.3	+3.5	appreciable	79.8	+1.0	trace
	5	75.5	3.3	"	77.7	1.1	"
	6	78.5	0.3	none	69.9	8.9	much
	7	69.1	9.7	much	64.7	14.1	very much
	8	68.5	10.3	"	62.9	15.9	"
	9	77.1	1.7	noticeable	69.5	9.3	much
	10	73.2	5.6	considerable	77.0	1.8	noticeable

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; + indicates whitening

TABLE XIX

Effect of Fade-Ometer exposure on yellowing (40-hour exposures)

(Cotton)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		79.7					
Product	1	81.0	+1.3	trace	82.0	+2.3	noticeable
	2	82.5	+2.8	appreciable	81.0	+1.3	trace
	3	80.6	+0.9	trace	79.0	0.7	negligible
	4	82.3	+2.6	noticeable	82.7	+3.0	appreciable
	5	81.5	+1.8	"	79.5	0.2	negligible
	6	81.0	+1.3	trace	80.2	+0.5	"
	7	80.0	+0.3	none	80.0	+0.3	"
	8	82.2	+2.5	noticeable	80.9	+1.2	trace
	9	81.3	+1.6	trace	81.8	+2.1	noticeable
	10	80.5	+0.8	"	79.6	0.1	none

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; + indicates whitening

TABLE XX

Effectiveness for softening fabric*

(Cotton)

		0.1% Panel member				0.5% Panel member			
		1	2	3	Total	1	2	3	Total
Control		12	12	11	35	12	12	12	36
Product	1	7	4	7	18	9	5	9	23
	2	5	2	3	10	1	2	3	6
	3	8	5	2	15	6	3	7	16
	4	6	8	9	23	8	10	10	28
	5	3	3	5	11	7	6	5	18
	6	2	1	6	9	5	1	2	8
	7	1	9	1	11	2	9	4	15
	8	11	6	4	21	3	4	1	8
	9	9	10	10	29	4	8	8	20
	10	4	7	8	19	10	7	6	23
	1 ex	10	11	12	33	11	11	11	33

*Low total indicates soft rating.

TABLE XXI

Seam strength*

(Cotton)

		0.1%	0.5%
Control		42.9	
Product	1	45.4	42.8
	2	47.9	43.4
	3	45.1	42.3
	4	43.0	44.2
	5	44.3	45.6
	6	45.1	44.0
	7	46.9	44.1
	8	43.4	40.2
	9	46.6	45.4
	10	46.0	43.2
	1 ex	44.4	44.8

*Given in pounds

their approximate softening efficiency as shown below.

	0.1 %	0.5 %	Combined ranking
Softest:	Product 6	2	Product 2 (softest)
	" 2	6	" 6
	" 7	8	" 7
	" 5	7	" 8
Intermediate:	" 3	3	" 5
	" 1	5	" 3
	" 10	9	" 1
	" 8		" 10
Least soft:	" 4	10	" 9
	" 9	1	" 4
	" 1ex	4	" 1ex
	1 ex		(harshest)

For the rating by panel see Table XX.

EFFECT ON SEAM STRENGTH ——Assuming a ±10% coefficient of variation only Product 2 shows a significant difference between control and treated strength. It would appear that the softeners are all essentially equal in these tests and generally show a slight increase in seam strength at both concentrations. Product 1 when applied by padding or exhaustion shows no significant difference. (See Table XXI.)

Nylon

EFFECT ON TEAR STRENGTH ——The effect of the agents on the tear strength of the fabric was determined by the tongue tear method. CCC-T-191b-5134 Tests were made on fabrics as treated with 0.5% and 0.1% active ingredient after accelerated aging and after heatsetting.

The effect of all agents was to increase the initial tear strength very much at the 0.5% loading. However, on lowering the concentration of agent to 0.1%, large differences were observed between many of the products. (See Table XXII.) They may be grouped as follows:

Products 2, 5, 7, and 10 produced a 60-75% increase.

Products 1, 3, 4, 6, 8, and 9 produced from none to a 40% increase.

All agents were very effective at the 0.5% loading for improving tear strength after heatsetting. (See Table XXIII). While the untreated fabric lost approximately 18% of its tear strength as a result of this treatment, all softeners were effective in retaining the strength of the original untreated fabric. Fabric treated with Product 1 is an exception to this—it loses about 20% of its original strength at the 0.5% concentration.

The softeners may be divided into two groups as follows:

Products 4, 5, 7, 8, and 9 produced a 125 to 140% increase.

Products 1, 2, 3, 6, and 10 produced a 70-115% increase.

TABLE XXII

Effect of softeners on tear strength

(Nylon)

	0.1% AI				0.5% AI			
	W	F	Av	% Increase	W	F	Av	% Increase
Control	16.3 lbs	15.6 lbs	16.0 lbs	Basis	16.3 lbs	15.6 lbs	16.0 lbs	Basis
Product 1	17.3	19.0	18.2	14	27.9	27.6	27.8	74
2	26.3	27.6	26.5	66	29.1	31.3	30.2	88
3	14.1	15.2	14.7	−8	27.1	29.1	28.1	76
4	20.5	22.3	21.4	34	29.6	29.3	29.5	84
5	25.7	24.5	25.1	57	27.1	29.3	28.2	77
6	19.2	17.4	18.3	15	27.9	27.6	27.8	74
7	28.5	26.9	27.7	73	29.7	31.1	30.4	90
8	17.6	17.5	17.6	10	28.6	26.2	27.4	71
9	22.4	22.4	22.4	40	30.5	29.0	29.8	86
10	28.8	26.8	27.8	74	29.6	29.1	29.4	84

TABLE XXIII

Effect of softeners on tear strength after heatsetting

(Nylon)

	0.1% AI				0.5% AI			
	W	F	Av	% Increase	W	F	Av	% Increase
Control	13.3 lbs	13.9 lbs	13.6 lbs	Basis	13.3 lbs	13.9 lbs	13.6 lbs	Basis
Product 1	16.1	14.8	15.5	14	20.5	25.5	23.0	69
2	17.2	16.3	16.8	23	28.5	28.0	28.3	108
3	24.6	25.4	25.8	90	27.0	27.6	27.3	101
4	18.2	19.9	19.1	40	30.3	30.7	30.5	125
5	23.7	27.9	25.8	90	30.6	30.3	30.5	125
6	18.1	17.9	18.0	32	29.1	29.1	29.1	114
7	30.5	29.4	30.0	120	30.7	31.4	31.1	129
8	26.5	24.8	25.7	89	33.6	32.2	32.9	142
9	21.5	25.9	23.7	75	32.7	31.9	32.3	138
10	16.0	15.4	15.7	15	27.5	30.5	29.0	114

On lowering the concentration of products to 0.1%, large differences were observed. The products may be grouped as follows:

Products 3, 5, 7, 8, and 9 produced a 75-120% increase.

Products 1, 2, 4, 6, and 10 produced a 15-40% increase.

The effect of accelerated aging was to lower the tensile strength of the untreated nylon fabric about 35%. (See Table XXIV.) However, the application of seven of the softening agents at the 0.5% level maintained the tear strength above that of the unaged, untreated fabric. Even at the 0.1% concentration, two products maintained the tear strength above the original untreated. The agents at the 0.5% loading may be divided into three groups. (See Figure 4.)

Products 2, 3, 5, 7, 8, and 9 gave a 135-185% increase over the aged, untreated control.

Product 6 gave a 70% increase.

Products 1, 4, and 10 gave a 0-35% increase.

The agents at the 0.1% loading may again be divided into three groups.

Products 3 and 7 gave a 100-140% increase.

Products 2, 5, 6, 8, 9, and 10 gave a 20-40% increase.

Products 1 and 4 gave essentially no increase.

It is difficult to draw general conclusions relating to the relative effectiveness of different chemical types. It is noted that Products 5 and 7 are outstanding for improving tear strength under the various conditions.

EFFECTIVENESS AS ANTISTATIC AGENTS———Of the ten softeners evaluated, only Products 1, 2, and 3 are effective antistatic agents on nylon at 25% and 50% relative humidity. These products are effective at the 0.5% level of application and not at the 0.1% level.

An effective agent is rated as one which provides the nylon with a lower resistivity or higher conductivity than a clean untreated cotton fabric. The effective antistatic effect, since it is quaternary ammonium type compounds or a quaternary ammonium type containing an amide group. Product 4, also a quaternary type, would not be expected to provide an effective antistatic effect, since it is known to produce a water repellent effect on textile fibers. Effective antistatic agents are believed to act by promoting formation of a condensed film of moisture on the fiber surface. The data obtained are shown in Table XXV.

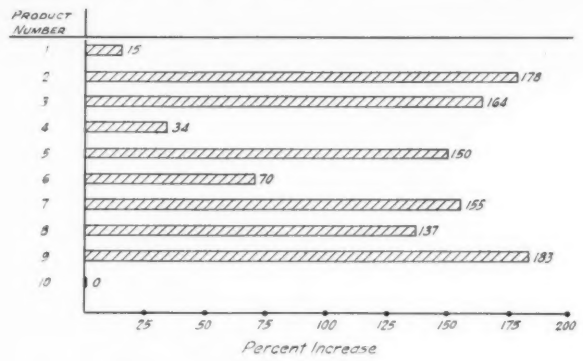


Figure 4
Effect of 0.5% softener on nylon fabric tear strength after accelerated aging

TABLE XXIV
Effect of softeners on fabric tear strength after accelerated aging
(Nylon)

		0.1% AI		0.5% AI	
		Warp lbs	% Increase Basis	Warp lbs	% Increase Basis
Control		10.1		10.1	
Product	1	10.6	5	12.6	15
	2	13.3	32	27.8	178
	3	19.9	97	26.7	164
	4	9.4	−7	13.5	34
	5	12.3	22	25.3	150
	6	13.2	31	17.1	70
	7	24.0	138	25.4	155
	8	12.8	26	23.9	137
	9	13.9	38	28.9	186
	10	13.5	34	10.1	0

TABLE XXV
Effectiveness as antistatic agents*
(Nylon)

		25% RH		50% RH	
		0.1%	0.5%	0.1%	0.5%
Control		13.8		11.7	
Product	1	13.8	11.4	13.6	10.5
	2	13.5	11.7	11.3	10.4
	3	13.8	12.4	13.7	11.4
	4	13.8	14.0	13.9	13.9
	5	13.9	13.5	13.8	11.7
	6	13.8	13.8	13 9	13.8
	7	13.7	13.7	13.8	13.3
	8	13.8	13.9	13.8	13.7
	9	13.8	13.3	13 6	13.3
	10	14.1	13.8	13.8	13.6
Untreated Cotton		12.7		10.4	

*Expressed as the log of the resistivity in ohms per square of fabric.

TABLE XXVI
Effect of application on yellowing
(Nylon)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		77.4		basis			
Product	1	77.5	+0.1	none	76.8	0.6	negligible
	2	77.9	+0.5	negligible	77.1	0.3	"
	3	75.9	1.5	trace	73.7	3.7	appreciable
	4	77.2	0.2	negligible	76.4	1.0	trace
	5	75.1	2.3	appreciable	77.2	0.2	negligible
	6	78.1	+0.7	negligible	76.9	0.5	"
	7	76.8	0.6	"	76.0	1.4	trace
	8	77.7	+0.3	"	76.3	1.1	"
	9	77.9	+0.5	"	77.2	0.2	negligible
	10	77.5	+0.1	none	77.9	+0.5	"

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; + indicates whitening

EFFECT OF SOFTNESS ON FABRIC YELLOWING———The degree of fabric yellowing caused by 1) treatment with the different products, 2) a Fade-Ometer exposure for 40 hours, 3) exposure to heatsetting for 15 seconds at 400° F, 4) aging for 5 days (120 hours) at 176°F was observed by differences in reflectance measured by a spectrophotometer at 400 mμ. Comparisons were made with a control fabric which, in each case, was padded through water, dried, and subjected to the same test.

The application of the agents, with two exceptions, caused from none to only a trace more yellowing than was experienced with a water control. The exceptions were Product 3 at 0.5% and Product 5 at 0.1% active ingredient, both of which gave an appreciable change. (See Table XXVI).

The effect of a 40-hour Fade-Ometer exposure was to decrease the yellowness of the untreated and all treated fabrics. None of the finishes caused any increase in yellowing compared with the original treatments. It is apparent that Product 5 affords noticeable protection against the bleaching effect of ultraviolet light on nylon. (See Table XXVII).

TABLE XXVII

Effect of Fade-Ometer exposure on yellowing

(Nylon)

(40-hour exposures)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		80.7	Basis				
Product	1	81.0	+0.3	negligible	80.0	0.7	trace
	2	80.3	0.4	"	79.2	1.5	"
	3	80.0	0.7	trace	78.9	1.8	"
	4	79.9	0.8	"	79.2	1.5	"
	5	78.4	2.3	noticeable	78.0	2.7	noticeable
	6	81.0	+0.3	negligible	79.9	0.8	trace
	7	80.5	0.2	"	79.6	1.1	"
	8	79.9	0.8	trace	78.9	1.8	noticeable
	9	79.3	1.4	"	80.0	0.7	negligible
	10	80.1	0.6	negligible	79.6	1.1	trace

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; + indicates whitening

TABLE XXVIII

Yellowing by agents from heatsetting

(Nylon)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		75.4		basis			
Product	1	77.3	+1.9	noticeable	76.6	+1.2	trace
	2	77.2	+1.8	"	76.5	+1.1	"
	3	75.2	0.2	negligible	69.4	6.0	much
	4	75.0	0.4	"	75.0	0.4	negligible
	5	74.7	0.7	"	75.1	0.3	"
	6	77.0	+1.6	noticeable	75.1	0.3	"
	7	75.7	+0.3	negligible	73.5	1.9	noticeable
	8	77.0	+1.6	noticeable	75.1	0.3	negligible
	9	76.6	+1.2	"	76.1	+0.7	"
	10	76.9	+1.5	"	75.9	+0.5	"

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; + indicates whitening

TABLE XXIX

Effect of accelerated aging on yellowing

(Nylon)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		73.2		basis			
Product	1	73.1	0.1	negligible	72.3	0.9	trace
	2	71.7	1.5	trace	73.2	0	none
	3	70.7	2.5	noticeable	56.3	16.9	much
	4	73.4	+0.2	negligible	72.3	0.9	trace
	5	64.9	8.3	much	69.1	4.1	considerable
	6	68.9	4.3	considerable	67.5	5.7	much
	7	71.4	1.8	noticeable	62.9	10.3	"
	8	72.9	0.3	negligible	72.4	0.8	trace
	9	71.1	2.1	noticeable	68.4	4.8	considerable
	10	62.3	10.9	much	63.4	9.8	much

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; + indicates whitening

The heatsetting operation did not result in increased yellowing of the treated fabrics compared with the heatset untreated control with two exceptions. Product 3 caused much yellowing at the 0.5% concentration, while Product 7 caused a noticeable increase in yellowing at the 0.5% level (See Table XXVIII).

Large differences in the yellowing of finishes were observed in the accelerated aging test. At the 0.5% level, Products 5 and 9 caused considerably greater yellowing and Products 3, 6, 7, and 10 very much greater yellowing than was observed for the control. At the 0.1% active ingredient level, Products 5, 6, and 10 caused from considerable to much yellowing. The quaternaries, Products 1, 2, and 4 and an imidazoline, Product 8, appear to be little affected by aging on nylon. (See Table XXIX).

From these data it appears that cationic softeners of the type of Product 3, and to a lesser extent Products 5 and 7, are not to be considered desirable for use on nylon from the standpoint of yellowing. Of added interest also is the fact that in all of these tests the quaternary compounds, Products 1, 2, and 4 as a group, appear to be little affected colorwise.

EFFECTIVENESS FOR SOFTENING FABRIC———The effectiveness of the different agents for softening nylon fabric was rated by a panel of three judges experienced in the evaluation of fabric handle. The fabrics were judged after conditioning at 70°F and 65% RH for 24 hours.

All agents were effective softeners, but there were perceptible differences between groups of them. In general, Product 10 produced outstanding softening effects at both 0.5% and 0.1% concentrations on the fabric. The relative order of effectiveness expressed as a ladder of descending effectiveness was:

Product 10 (most effective)
Products 2, 5
Products 1, 4, 6, 7
Products 8, 9
Product 8 (lowest effect)

The difference between Product 10 and Products 2 and 5 was noticeable; the difference between Product 10 and Product 8 was appreciable, but it is emphasized that all products produced softening effects. These comparisons are on an active ingredient basis and do not relate to money value. The above conclusions are a combined judgment of properties at both concentrations of the agents.

The product applied at 0.5% level gave an effect of too much finish with a feeling of concentration at the surface. The relative order of effectiveness was:

Product 10 (most effective)
Products 1, 2, 4, 5
Products 6, 7
Products 3, 9
Product 8 (least effective)

The differences between successive groups were small, but the difference between Products 10 and 8 was appreciable.

Observations of fabrics treated with 0.1% active ingredient gave the following order of effectiveness:

Product 10 (most effective)
Products 2, 6, 5
Products 1, 4, 7
Products 3, 8, 9 (least effective)

Again, the difference between successive groups were small, but the difference between Product 10 and Products 3, 8, and 9 was appreciable.

The best softening was obtained with the long chain alkyl ketene dimer. It is difficult to generalize among the remaining products.

Rayon

EFFECT ON TEAR STRENGTH———Since experience with this rayon fabric has shown that fillingwise tear strength tests are variable and unreliable, only warp tests were made.

The effect of all the softeners in either 0.1% or 0.5% concentration when applied by the padding technique did not significantly influence tear strength of the treated fabric from the water control fabric. The

greatest loss was 6.6% and the highest increase was 3.3%. These changes are well within the experimental limits of the fabric and the test.

Product 1 was also applied from a long bath at 0.4% and 2.0% concentration based on fabric weight. Again there was no significant change in the tear strength. The data is tabulated in Table XXX.

Heat treatment of the rayon fabric at 300°F for 7 minutes to simulate curing conditions had no apparent effect on the tear strength of the water control rayon fabric. The tear strength of the softener treated fabrics likewise showed no appreciable change during heat treatment. (See Table XXX).

The accelerated aging of the water control showed practically no change from the unaged control. Products 1, 2, 3, 4, and 10 showed tear strength increases of from 6.6% to 12.3% while the other products showed practically no change. (See Table XXX).

Considering these data, generally it would appear that the products tested do not improve tear strength over that of a water control rayon fabric. The tear strength is not appreciably changed by heat treatments such as curing but some protection seems to be given by the quaternary type and the ketene dimer softeners when the treated fabrics are subjected to aging.

EFFECT ON FABRIC YELLOWING——The pad application of 0.1% Product 1 had a noticeable whitening effect on the rayon fabric while Products 3, 4, 5, 8, and 9 gave very minor changes at both concentrations. At the higher concentration, Products 2 and 6 yellowed the rayon fabric to a greater extent than any of the other softeners. It is interesting to note that while Product 1 gave no yellowing by pad application, fabric treated by the exhaustion method was considerably discolored. (See Table XXXI).

On exposure to heat at 300°F for 7 minutes all samples at both concentrations yellow. Products 5 and 10 at both concentrations yellow to a much lesser degree than all other products. (See Figure 5). Exposure to dry heat caused more discoloration in all samples tested than either the aging test or the Fade-Ometer test. (See Table XXXII).

Accelerated aging caused yellowing ranging from a trace to very much. Both concentrations of Products 4, 5, 6, 7, 8, and 10 appear to resist yellowing, while 0.5% concentration of Products 2 and 9 gave yellowing varying in

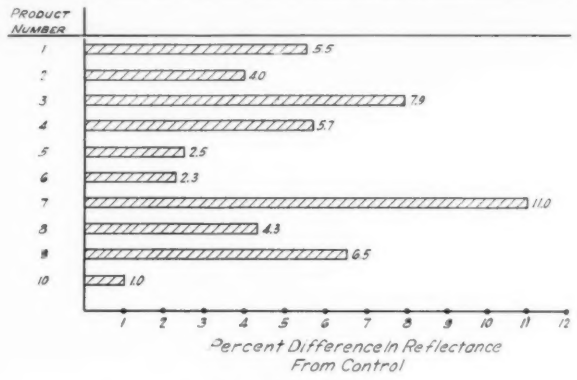


Figure 5
Effect of resin curing conditions on yellowing by 0.5% softeners on rayon

TABLE XXX
Tear strength data*
(Rayon)

		Effect of softener		Effect of heat treatment		Effect of accelerated aging	
		0.1% W	0.5% W	0.1% W	0.5% W	0.1% W	0.5% W
Control		6.1		5.7		5.9	
Product	1	6.0	6.0	6.0	6.0	6.6	6.3
	2	6.2	6.3	6.2	6.2	6.3	6.6
	3	6.0	5.7	5.8	6.0	6.4	6.4
	4	5.7	5.7	5.8	5.6	6.4	6.1
	5	6.1	5.8	6.0	5.9	6.0	6.0
	6	6.1	6.2	6.0	6.0	6.1	6.1
	7	6.1	5.9	6.1	5.8	5.8	6.0
	8	6.3	6.0	6.3	6.2	6.2	6.2
	9	6.3	6.2	6.2	6.3	6.4	6.5
	10	5.9	5.9	5.9	6.4	6.3	6.5
1 ex	**	5.7	5.9	5.6	5.7	6.0	6.1

*Average of five tests. Results reported in pounds.
**Applied by exhaustion.

TABLE XXXI
Effect of application on yellowing
(Rayon)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		66.7					
Product	1	69.0	+2.3	noticeable	67.4	+0.7	negligible
	2	66.6	0.1	none	63.3	3.4	appreciable
	3	66.4	0.3	negligible	68.0	+1.3	trace
	4	67.8	+1.1	trace	66.6	+0.1	none
	5	67.6	+0.9	negligible	68.0	+1.3	trace
	6	66.5	0.2	none	58.0	8.7	very much
	7	63.6	3.1	appreciable	67.5	+0.8	negligible
	8	66.8	+0.1	none	68.4	+1.7	trace
	9	67.6	+0.9	negligible	68.4	+1.7	"
	10	68.4	+1.7	trace	65.0	1.7	noticeable
1 ex	***	64.8	1.9	noticeable	61.0	5.7	very much

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; +indicates whitening
***Applied by exhaustion from long bath

TABLE XXXII
Effect of application on yellowing
(Rayon)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		66.0					
Product	1	63.5	2.5	noticeable	60.5	5.5	very much
	2	64.6	1.4	trace	62.0	4.0	considerable
	3	62.0	4.0	considerable	58.1	7.9	very much
	4	60.5	5.5	much	60.3	5.7	much
	5	64.1	1.9	noticeable	63.5	2.5	noticeable
	6	60.5	4.5	considerable	63.7	2.3	"
	7	61.5	3.5	appreciable	55.0	11.0	very much
	8	60.6	5.4	much	61.7	4.3	considerable
	9	62.8	3.2	appreciable	59.5	6.5	much
	10	64.0	2.0	noticeable	65.0	1.0	trace

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control

TABLE XXXIII

Effect of accelerated aging on yellowing

(Rayon)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		60.1					
Product	1	56.3	3.8	considerable	58.5	1.6	noticeable
	2	61.6	+1.4	trace	56.6	3.5	appreciable
	3	57.7	2.4	noticeable	57.7	2.4	noticeable
	4	59.2	0.9	trace	62.9	+2.8	"
	5	62.2	+2.1	noticeable	60.7	+0.6	negligible
	6	60.0	0.1	none	60.0	0.1	none
	7	58.9	1.2	trace	58.4	1.7	noticeable
	8	58.9	1.2	"	58.9	1.2	trace
	9	64.0	+3.9	considerable	55.1	5.0	much
	10	63.3	+3.2	appreciable	63.3	+3.2	appreciable

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; +indicates whitening

TABLE XXXIV

Effect of Fade-Ometer exposure on yellowing

(Rayon)

(40 hour exposures except as noted)

		0.1%			0.5%		
		R*	D**	Change	R*	D**	Change
Control		66.3					
Product	1	70.0	+3.7	appreciable	70.0	+3.7	appreciable
	2	66.5	+0.2	none	64.0	2.3	noticeable
	3	67.5	+1.2	trace	68.0	+1.7	trace
	4	67.8	+1.5	"	68.7	+2.4	noticeable
	5	69.3	+3.0	appreciable	69.0	+2.7	"
	6	68.0	+1.7	trace	64.0	2.3	"
	7	67.0	+0.7	negligible	67.5	+1.2	trace
	8	69.0	+2.7	noticeable	69.0	+2.7	noticeable
	9	67.6	+0.3	none	68.4	+2.1	"
	10	68.3	+2.0	appreciable	67.5	+1.2	trace
1 ex	***	66.0	0.3	negligible	66.5	+0.2	none

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; +indicates whitening
***Applied by exhaustion from long bath

TABLE XXXV

Effectiveness for softening fabric*

(Rayon)

		0.1% Panel member				Total	0.5% Panel member				Total
		1	2	3	4		1	2	3	4	
Control		5	1	5	3	14					
Product	1	3	3	3	5	14	3	1	5	1	10
	2	5	3	5	5	18	1	1	1	1	4
	3	1	1	3	1	6	1	1	3	1	6
	4	3	1	1	1	6	1	5	1	1	8
	5	5	3	3	1	12	1	1	5	3	10
	6	1	1	3	5	10	5	1	1	5	12
	7	5	3	1	5	14	1	5	5	3	14
	8	5	3	3	5	16	3	1	5	5	14
	9	5	5	1	5	16	1	5	5	3	14
	10	3	3	5	5	16	5	1	3	1	10
1 ex	**	3	1	5	1	10	5	1	1	3	10

*Low totals indicate softer fabrics.
**Percentages based on weight of fabrics, applied by exhaustion from a long bath.

TABLE XXXVI

Effect on seam strength

(Rayon)

		0.1%	0.5%
Control		42.6	
Product	1	48.3	43.3
	2	47.8	38.6
	3	43.9	46.9
	4	37.7	39.1
	5	40.3	41.4
	6	39.0	41.4
	7	41.2	39.9
	8	42.9	42.5
	9	40.8	41.0
	10	42.7	39.2
1 ex	*	40.1	41.4

*Applied by exhaustion from long bath

intensity from appreciable to much. Fabric treated with Product 10 actually showed a whitening effect at both application levels. (See Table XXXIII).

After 20 hours Fade-Ometer exposure only 0.5% of Products 2 and 6 yellowed. A bleaching action was noted in many instances which is noted in data table by a plus value. Exposed fabrics were examined at 10 hour intervals and those showing no yellowing carried to 40 hours. (See Table XXXIV).

EFFECTIVENESS FOR SOFTENING FABRIC———The softening efficiency of the various softeners was judged by a panel of four (4) persons experienced in evaluating handle of fabrics. The samples were grouped into three lots rated as firmest, intermediate, and softest. Due to a wide variance in ranking between judges a rating system was used allocating 1 point for the softest, 3 points for the intermediate, and 5 points for the firmest—a total of 4 points being the softest rating obtainable. The samples were not rated at equal concentration levels but as a group. (See Table XXXV).

Product 2 when applied at 0.1% concentration was given the firmest rating, yet when applied at 0.5% concentration was given the softest rating and was the only sample every panel member agreed upon. Products 3 and 4 were the other two softeners that were given soft ratings. All three of these products are classified as quaternary type materials. (See Table XXXV).

EFFECT ON SEAM STRENGTH———With the exception of Products 1 and 2 applied at 0.1% concentration, the softeners had little or no effect upon the seam strength of rayon when compared with a water control. These two products increased seam strength 12 and 13% respectively. (See Table XXXVI).

Wool

EFFECT ON TEAR STRENGTH———The effect of all softeners at the 0.6% level was negligible except for an apparently significant warpwise and fillingwise loss in the case of Product 8. At 0.12% concentration greater differences were noted; ie, Products 1, 3, 6, and 8 produced 10-15% decreases. All other agents, however, had little effect on tear strength at the lower concentration. (See Table XXXVII).

Heat treatment of the wool fabric brought about a 20% loss in the scoured fabric but the softener treated fabrics, with the exception of Product 10, all maintained a major portion of their strength. This is evident at both application concentrations. Product 10 appears to offer no protective advantages while all other agents significantly reduce the tear strength loss due to heat treatment at 275°F for 5 minutes.

The effect of accelerated aging was to lower the tear strength of the untreated wool fabric approximately 35%. However, the effect of all

TABLE XXXVII
Tear strength data*
(Wool)

	Effect of softener 0.12% W	F	0.6% W	F	Effect of heat treatment 0.12% W	F	0.6% W	F	Effect of accelerated aging 0.12% W	0.6% W
Control	5.3	4.6	5.3	4.6	4.2	3.7	4.2	3.7	3.5	3.5
Product 1	4.4	4.1	4.9	4.2	5.0	3.7	4.7	3.7	4.7	4.6
2	5.7	4.5	5.7	4.9	4.8	3.9	5.0	3.9	4.7	4.7
3	4.7	3.7	5.1	4.4	4.8	4.2	5.7	4.2	3.9	4.4
4	5.4	4.9	5.7	4.8	4.6	3.7	4.9	4.1	3.9	4.5
5	4.9	4.1	5.0	4.0	5.0	4.1	5.1	4.0	3.8	4.0
6	4.7	3.8	4.8	4.0	4.7	3.7	5.0	4.1	3.8	3.8
7	4.9	3.8	5.0	4.4	5.1	4.1	4.8	4.3	3.9	4.0
8	4.5	3.9	4.6	4.1	4.9	3.9	5.1	4.3	4.6	4.7
9	4.8	3.7	5.1	3.8	5.0	3.7	4.9	4.1	3.3	5.1
10	5.4	4.7	5.7	5.2	4.2	3.7	4.6	4.1	3.3	4.6

*Given in pounds of force required to tear fabric

TABLE XXXVIII
Effectiveness as antistatic agents*
(Wool)

	40% RH 0.12%	0.6%	60% RH 0.12%	0.6%
Control	13.3			
Product 1	15.0	15.0	14.1	13.1
2	15.0	15.0	13.3	13.2
3	15.0	12.9	13.5	10.7
4	13.4	13.8	13.1	12.9
5	14.2	13.4	13.3	13.2
6	15.0	15.0	13.3	13.2
7	15.0	15.0	13.6	13.2
8	15.0	15.0	14.5	12.9
9	15.0	15.0	13.4	13.4
10	13.6	13.4	13.5	14.2

*Expressed as the log of the resistivity in ohms per square of fabric

softeners at the 0.6% level was to decrease this strength loss. Products 1, 2, 4, 8, 9, and 10 show only a 10-15% loss over the aged, untreated fabric. Products 3, 5, 6, and 7 produce minor improvement over the aged, untreated fabric.

At the 0.12% level, the protection afforded by the presence of the softener is less noticeable. With a loss of 35% in the untreated, fabric treated with Products 1, 2, and 8 show only 10% loss. All other softeners offer insignificant protection from strength loss at the lower concentration. (See Table XXXVII).

Considering these data, generally it would appear that the straight quaternary type of cationic softener offers added protection against the degrading effects of processing temperatures and aging of this wool fabric.

EFFECTIVENESS AS ANTISTATIC AGENTS———The data obtained from resistivity measurements indicate that these cationic softeners are generally not good antistatic agents for wool. One exception to this is Product 3 which when applied at the 0.6% level reduces the static potential noticeably. This was true at both 40% and 60% RH. (See Table XXXVIII).

EFFECT ON FABRIC YELLOWING———Application of the softeners, with two exceptions, caused a very minor degree of yellowing on wool. Products 3 and 5 effected a noticeable change at the 0.6% softener level, and Product 4 caused noticeable yellowing at both concentrations. (See Table XXXIX).

On exposure to heat, very significant changes were noted on all softener treated samples, whereas, the effect of heat on the untreated fabric was negligible. Products 3, 5, 6, and 8 result in considerable yellowing at the 0.6% application level. Products

TABLE XXXIX
Effect of application on yellowing
(Wool)

	0.12% R*	D**	Change	0.6% R*	D**	Change
Control	42.3					
Product 1	41.2	1.1	trace	41.3	1.0	trace
2	42.0	0.3	negligible	42.3	0	none
3	42.5	+0.2	none	40.0	2.3	noticeable
4	40.5	1.8	noticeable	40.5	1.8	"
5	40.9	1.4	trace	40.5	1.8	"
6	42.1	0.2	negligible	41.6	0.7	negligible
7	41.1	1.2	trace	41.5	0.8	"
8	41.0	1.3	"	41.0	1.3	trace
9	42.0	0.3	negligible	42.0	0.3	negligible
10	40.8	1.5	trace	41.0	1.3	trace

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control; + indicates whitening

TABLE XL
Effect of heat treatment on yellowing
(Wool)

	0.12% R*	D**	Change	0.6% R*	D**	Change
Control	42.0					
Product 1	38.5	3.5	appreciable	39.5	2.5	noticeable
2	39.5	2.5	noticeable	40.5	1.5	trace
3	39.5	2.5	"	37.5	4.5	considerable
4	38.5	3.5	appreciable	38.5	3.5	appreciable
5	38.5	3.5	"	38.0	4.0	considerable
6	39.5	2.5	noticeable	37.5	4.5	"
7	39.0	3.0	appreciable	39.0	3.0	appreciable
8	39.5	2.5	noticeable	37.7	4.5	considerable
9	39.5	2.5	"	39.5	2.5	noticeable
10	39.0	3.0	appreciable	40.0	2.0	"

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control

4 and 7 also promote appreciable yellowing at both concentrations. Differences between the degree of yellowing by all softeners is not nearly as great at 0.12% as at 0.6% active ingredient. (See Table XL).

Appreciable yellowing of the untreated wool fabric is noted on accelerated aging: Product 2 produced considerable yellowing at both levels while 0.12% of Product 6 and 0.6% of Product 9 resulted in very much yellowing. In this respect, Products 3, 7, and 10 appear to be the most acceptable of the group. (See Table XLI and Figure 6).

EFFECTIVENESS FOR SOFTENING FABRIC———All softeners appear to be equally effective in imparting a definite softness to the fabric. The panel rating the treated fabrics agreed that differentiation was difficult within either concentration group since relative ratings on a second or third evaluation by a given member were very erratic.

EFFECT ON SEAM STRENGTH———There does not appear to be any significant change in the seam strength of this wool fabric as a result of treatment with any of the softeners. Averages of the test results of the treated fabrics all fall within the range of the results obtained on the control fabric. It appears that this is a superior fabric in this respect

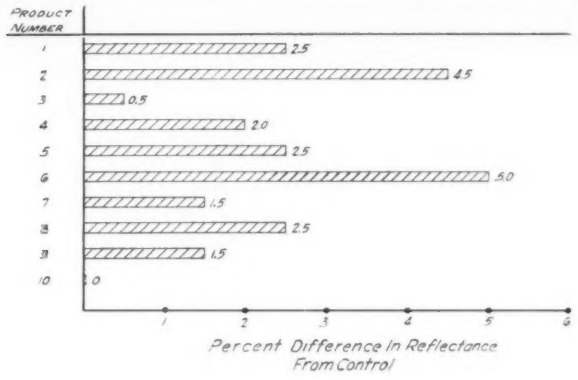


Figure 6
Effect of accelerated aging on yellowing by 0.12% softeners on wool

TABLE XLI
Effect of accelerated aging on yellowing
(Wool)

		0.12%			0.6%		
		R*	D**	Change	R*	D**	Change
Control		39.5					
Product	1	37.0	2.5	noticeable	36.0	3.5	appreciable
	2	35.0	4.5	considerable	36.0	3.5	"
	3	39.0	0.5	negligible	37.5	2.0	noticeable
	4	37.5	2.0	noticeable	37.5	2.0	"
	5	37.0	2.5	"	36.0	3.5	appreciable
	6	34.5	5.0	very much	36.5	3.0	"
	7	38.0	1.5	trace	38.0	1.5	trace
	8	37.0	2.5	noticeable	36.5	3.0	appreciable
	9	38.0	1.5	trace	33.5	6.0	very much
	10	39.5	0	none	38.0	1.5	trace

*Reflectance, percent, at 400 mμ
**Difference in percent reflectance from control

since in many tests the cotton sewing thread broke at the seam indicating that the thread's extensibility limits had been exceeded. (See Table XLII).

Summary and Conclusions

The above discussion permits the following general conclusions on the effect of the softener properties studied.

TEAR STRENGTH———Application of these softeners generally improved tear strength of all fabrics included in this study except rayon and wool. Rayon shows no improvement while the wool fabric tear strength was decreased slightly. Increases in tear strength on application are probably due to better stress distribution which results from improved lubricity.

The effect of heat treatment such as encountered during resin curing or fabric setting operations is dependent upon the particular fiber. Acrilan, Arnel, cotton, and rayon show no significant changes while the presence of cationic softeners on nylon and wool serves to retain tear strength values well above untreated fabrics.

The effect of accelerated aging on softener treated fabrics was varied. Acrilan and Arnel generally show little change from the originally treated fabrics. Product 5, the amine hydrochloride, on Acrilan gives a 50% increase in tear strength due to aging which places it on a level with the other softeners. This is probably due to a migration of the softener from fabric and yarn surfaces into the interstices to improve stress distribution. Cotton and rayon fabrics show minor changes but untreated nylon and wool lose about 35% of their original strength. The presence of some softeners reduces this loss considerably.

ANTISTATIC EFFECTIVENESS ———The quaternary ammonium compounds, with the exception of Product 4, are effective antistatic agents on the hydrophobic fibers. Product 2 is especially notable in this respect. Product 4, a water repellent, is not effective since antistatic agents are believed to act by promoting formation of a condensed film of moisture on the fiber surface.

COLOR CHANGE————Application of the softeners did not discolor the fabrics significantly. There are several exceptions noted in the tables.

Aside from the fact that heat treatment causes a color change of Arnel fabrics treated with the quaternary ammonium compounds, effects on the other fabrics appear to be dependent on the properties of the individual softeners. All softeners on Acrilan and nylon noticeably decrease yellowing while all result in some change on rayon and wool. The effect is varied on cotton with only Products 1, 2, 4, and 10 resulting in no yellowing.

No group of chemically related softeners or single softener shows similar effect on color change of all fibers as a result of accelerated aging. Those which appear good on one fiber may be poor on another. Product 10, the nonionic softener, is acceptable in this respect on Acrilan, Arnel, rayon and wool; while Product 4 was generally resistant to change on all fabrics.

The presence of the softeners had no adverse effect on color change of any of the fabrics upon Fade-Ometer exposure. Untreated hydrophobic fibers which normally show a bleaching effect are no more yellow and in many instances exhibit a resistance to bleaching after softener application.

SOFTENING———Judging the softeners on their relative softening merits was difficult on all fabrics. Product 2, a quaternary, was rated high on the cellulosics while Product 7 appears effective on the hydrophobic fibers.

SEAM STRENGTH———The seam strength of the fabrics was not significantly affected by the application of any softener.

CHEMICAL STRUCTURE ——— The chemical structure of the softeners does not appear to be generally related to their effects on a given fiber with some exceptions as noted. Undoubtedly, impurities and undisclosed constituents have some influence on the properties investigated.

(Concluded on page P64)

TABLE XLII
Effect on seam strength
(Wool)

		0.12%	0.6%
Control		66.0	
Product	1	68.7	68.7
	2	64.8	68.2
	3	66.8	68.1
	4	67.5	69.9
	5	70.2	66.9
	6	66.1	67.9
	7	67.4	69.9
	8	66.2	69.5
	9	68.5	68.5
	10	66.1	67.1

Rhode Island Section———

APPLICATIONS OF SONIC TECHNIQUES IN THE TEXTILE INDUSTRY*

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INTRODUCTION

THE principal applications of sonic techniques in the textile field are dyeing and cleaning. There are minor applications, such as rinsing, fibrillation of certain vegetal fibers, and removal of froth from liquid surfaces. We will limit our attention to the two major applications.

Ultrasound acts on textile fibers by means of mechanical or rather hydrodynamic forces associated with cavitation and through heating of the fiber surface. The former action is the more important one.

DISCUSSION

TEXTILE DYEING———We will now see how dyeing processes can be promoted by the action of ultrasound. The effects of ultrasonic irradiation in this application are threefold:

I. Dispersion
   a) On a macroscopic scale breaking up and dispersion of pigment and dyes in the solution
   b) On a microscopic scale breaking up of micelles of pigments of large molecular weight

II. Degassing of the solution

III. Penetration of the fiber
   a) On a macroscopic scale penetration of a closely woven fabric
   b) On a microscopic scale increased rate of diffusion of pigment into the fiber by piercing the insulating layer covering the fiber, by diffusing the pigment or dye stuff in the fiber and by accelerating chemical reactions, if any, between fiber and dye.

Effects I and II are promoted by the mechanical action of cavitation, while Effect III is due both to the mechanical action and to heating of the fiber surface.

In the case of water-soluble dyes, ultrasound constitutes mostly an effective means of mechanical agitation. In the case of pigments which are not soluble in water, ultrasound provides a means of pigment dispersion and penetration which is not provided by the conventional method. Fabrics composed of hydrophobic fibers can be dyed a darker color and more thoroughly than is possible by conventional means. Ultrasonic irradiation also produces a greater evenness in color. In all cases the process is accelerated. In one particular test the dyeing time was reduced to 16 and 35% of its normal value. In processes such as the Burlington process, where the material is too closely packed to permit improvement of fiber penetration as a result of ultrasonic action, the use of ultrasound can still be beneficial in that it promotes pigment dispersion and degassing of the solution. Damage to fabric was noted in only one test performed on linen at 3 kc/s.

The frequency used affects the results as follows: Irradiation at very low frequencies of the order of 50 or 100 c/s produces no effect. Frequencies in the range between 22 and 175 kc/s have been found to be most effective, the latter frequency being preferable for silk, wool and nylon. Very high frequencies in the megacycle range are of interest for laboratory purposes only, owing to their very rapid attenuation.

In this connection it is to be noted that the attenuation of ultrasonic waves is smaller for loose-weave fabrics and bulk fibers than for tightweave fabrics. If a fabric is treated it must be evenly exposed over its whole width to the ultrasonic beam. Also, care must be taken to avoid creases and other circumstances causing shielding of certain areas of the fabric. In general, it is desirable to use a fairly shallow trough so as to avoid unnecessary dilution of the ultrasonic energy in a large volume of liquid. The fabric should be located quite close to the bank of ultrasonic transducers, the optimum distance being determined by the material and the frequency used.

TEXTILE CLEANING———Ultrasonic irradiation of material being cleaned permits the use of lower temperatures and less, if any, detergent. Hence, damage inflicted to sensitive fabrics such as nylon by boiling and strong chemicals can be eliminated.

The application of sonic techniques to wool cleaning seems particularly promising. Successful experiments have already been reported on wool scouring for the purpose of removing tar, oil and lanolin. (The exact amount of lanolin removed can be closely controlled by adjusting the length of the irradiation time or the power of the transducer.) Other applications which have as yet not been reported in the literature but seem promising are the removal of ashes of carbonized vegetal matter after acid treatment of the wool and wool bleaching.

Sonic techniques have been successfully applied to laundering. It has been reported that cotton irradiated by a powerful siren is cleaned as effectively in one hour and with five changes of water as by conventional laundering in eight hours with fifty changes of water. Finally, it may be mentioned that a German firm, the Ultrakust Company, makes a laundering device which embodies an electrodynamically driven rod and diaphragm.

ECONOMIC CONSIDERATIONS———A number of technical papers are available which cover the field rather unsystematically and do not touch upon certain subjects. The greatest lack of information lies, however, in the field of economics, as to when it is economically justifiable to supplement existing dyeing and cleaning installations with ultrasonic equipment.

* Summary of a talk given at a meeting of the Rhode Island Section Intersectional Contest Committee at the Sheraton-Biltmore Hotel, Providence, RI, on Dec 10, 1956.

Ultrasonic techniques are widely used in instrumentation and testing, as well as in the processing of inherently expensive materials or in performing various operations which cannot be achieved by any other means. The difficulty in the textile field is that large quantities of relatively inexpensive materials must be treated. Ultrasonic equipment is inherently expensive, at least in most of the forms in which it is today available. Even with this drawback the use of ultrasound may be justified if it helps to achieve important results such as the dyeing of hydrophobic fibers or the elimination of damage to sensitive fabrics as a result of scouring. It would appear, however, that in cases where the results achieved are merely in the nature of an acceleration of a process, the use of the presently available ultrasonic equipment is not economically justifiable with the possible exception of barium titanate transducers and, for applications such as pigment dispersion and degassing, a certain type of underwater whistle. It should be emphasized that this statement is not based on any methodical calculation of the costs involved.

In attempting to formulate the future role of sonic techniques in the textile field it is important to consider that powerful, inexpensive transducers are at present being developed. Among the most promising ones is a transducer in the form of a spark generator periodically producing powerful shock waves by means of spark discharges. The action of such short-lasting but extremely intense releases of power has already been tried with considerable success in the field of wool scouring. It may be noted here that this phenomenon cannot be described as ultrasonic, since it takes place at a very low frequency, a frequency which falls even below the audible range. For that matter a distinction between the audible and ultrasonic frequency range is an artificial one when applied to industrial liquid processes. This is the reason why the word "sonic" rather than "ultrasonic" has been used in the title of this talk to describe the techniques being discussed.

Another solution presently under investigation is to generate acoustic waves by means of a hydrodynamic oscillator or whistle. Such a device transforms a DC fluid flow directly into an AC fluid flow which is equivalent to an acoustical wave. The simplicity of this approach is apparent when one remembers that conventional transducers transform electrical energy into acoustical energy, the electrical energy being provided by a generator driven by a turbine, which in turn is activated by a DC flow of water, steam, or gas. Hydrodynamic oscillators are desirable not so much because of their greater efficiency as because of their inherently low initial cost. When such inexpensive sources of sonic energy become commercially available they should find many applications in the textile industry. In any case a rather rigorous study will be required to determine the most favorable combination of such factors as speed of processing and sonic power provided.

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MEMBERSHIP APPLICATIONS

Raymond H Palmer—Overseer of dyeing, Burlington Narrow Fabrics, Burlington Industries, South Hill, Va. Sponsors: D M Norket, D A Torrence.

David A Qualls, Jr—Colorist, Collins & Aikman Corp, Albemerle, N C. Sponsors: E J Grajeck, G R Currier.

Robert P Restrepo—Sales repres, Alco Oil & Chemical Corp, Philadelphia, Pa. Sponsors: O B Hager, F M Tolin.

Ernest E Tabor—Overseer of dyeing, Bachmann Uxbridge Worsted Corp, Uxbridge, Mass. Sponsors: R D Robinson, B M Young.

Rufus Taylor—Supt of dyeing & bleaching, Seekonk Lace Works, RI Lace Works, West Barrington & Pawtucket, R I. Sponsors: A J Lombard, G D Miller.

JUNIOR

Kathleen M Raab—Chemist, Raytex Chemical Corp, Allentown, Pa. Sponsors: C K Black, C A Sylvester.

ASSOCIATE

Walter E Haney—Sales mgr, F H Ross & Co, Atlanta, Ga.

CORPORATE

Sanitized, Inc
The Tanatex Corp

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

Frederick J Di Carlo
Robert H Freeman
Robert K Shaughnessy
Jerome M Weisman

STUDENT

Joan L Marvel—Purdue University. Sponsor: R W Padgett.

Barbara L Niemeyer—Purdue University. Sponsor: R W Padgett.

Susanne M Wheaton—Purdue University. Sponsor: R W Padgett.

Sukhlal S Parekh — Philadelphia Text Inst. Sponsor: W H Hughes.

James B de Melo—Bradford Durfee Tech Inst. Sponsor: J Watters.

SENIOR

George S Baird—Technical repres, Hercules Powder Co, Wilmington, Del. Sponsors: J B Batdorf, R H Jenkins, Jr.

Eugene M Cohen—Dyer-chemist, Nu-Method Dyeing & Processing Co, Union City, N J. Sponsors: J D Matos, C H Ludders.

Rafael Fridbergs—General mgr, Estamperia Paris SRL, Ciudadela, Argentina. Sponsors: F Raff, R W Jacoby.

Stephen G Hasty—Textile chemist, Collins & Aikman Corp, Albemarle, N C. Sponsors: E J Grajeck, G R Currier.

James C Hayes, Jr—Textile sales (dyes & chemicals), E I du Pont de Nemours & Co, Inc, New York, N Y. Sponsors: K P Ferguson, B F Quigley.

Owen K Hutchinson—Dyer, Princeton Hosiery Mills, Princeton, Ky. Sponsors: L Hoehn, Jr, J O Sweitzer.

Leak G Lovin, Jr—Textile sales development, Celanese Corp of America, Charlotte, N C. Sponsors: L B Arnold, Jr, V P Holland.

Minutes———

190th Meeting
TECHNICAL COMMITTEE ON RESEARCH

THE one hundred and nintieth meeting of the Technical Committee on Research was held at the Hotel Statler, New York, NY, on Friday, November 16, 1956, with the following members present:

C A Sylvester, *chairman;* J A Woodruff, *secretary;* C W Dorn, *chairman of the Executive Committee on Research;* H W Stiegler, *director of research;* M J Babey, C A Baker, K H Barnard, W H Bertolet, V L Chase, H A DesMarais, H C Donaldson, F Fortess, E Freedman, P J Fynn, A H Gaede, G M Gantz, S N Glarum, H E Hager, A E Hirst, R W Jacoby, H Y Jennings, E R Kaswell, J V Killheffer, W Klaas, G O Linberg, H E Millson, J E Norton, B R Norwick, G P Paine, V S Salvin, C H A Schmitt, P Seydel, P J Smith, R B Smith, R H Souther, J G Stass, R L Stutz, L S Thompson, R Thornton, J F Warner, R L Wayland, and M W Winkler.

Chairman Sylvester opened the meeting with a report by Mr Dorn, who discussed a recently published article entitled "Comments Invited by FTC on Dyed Fabric Descriptions." In this article, it was stated that one spokesman said that he thinks the lack of any generally accepted test methods for colorfastness and resistance to fading also contributes to the ambiguity of such terms as "colorfast." This statement will be refuted by giving publicity of the new CS-59 tests when they have been approved.

Mr Sylvester welcomed to TCR three new members, the appointment of whom had been given ECR approval: P J Fynn, F Fortess and G Smith. ECR also approved transfers of the committees on snag resistance and standard depths of shade from active to reference status.

It was noted that Council approval had been given to change from tentative to standard tests the tests for snag resistance (65-54), resistance to water penetration (Impact Penetration Test 42-52), and resistance to wetting (Static Immersion Absorption Test 21-52).

New TCR subcommittee chairmen were approved as follows:

Committee	*Chairman*
Rapid Control Tests	M Winkler
Colorfastness to Washing	R Smith
Dimensional Changes	J Warner
Antistatic Finishes	F H Steiger
Water Absorbency	P B Roth

It was voted to propose to the Council a motion to have future meeting times arranged in conjunction with Council meetings as follows: Research committee meetings, Wednesday morning and afternoon and Thursday morning; Technical Committee on Research, Thursday noon; Executive Committee on Research, Thursday afternoon and evening; and the Council, Friday morning.

Mr Sylvester asked for comments on the booklet "Guide for Committee Chairmen."

REPORT OF THE RESEARCH DIRECTOR——Dr Stiegler reported on the projects now active in the AATCC research laboratories at Lowell. These projects are reported upon in full in Dr Stiegler's report to the Executive Committee on Research.

1) Application of the Accelerotor to the study of abrasion, end-use wear of textiles and the development of methods for evaluation of resistance of textiles to abrasion.

2) Dimensional changes:
   a) The development of an accelerated shrinkage test
   b) The development of a dimensional restorability test

3) Flammability:
   a) Development of an alternative drycleaning and washing procedure for the flammability test
   b) Study of brushing techniques
   c) Comparison of specimen holders
   d) Tumble drying versus air drying

4) Lightfastness:
   a) The investigation of conditions which influence fading of textiles by sunlight and daylight
   b) Fading of color by 1000-watt and 2000-watt incandescent lamps
   c) Fading of color by fluorescent lamps alone and in combination with incandescent lamps
   d) The effect of variations in arc voltage on fading in the Fade-Ometer

5) Washfastness:
   Development of an accelerated test to predict behavior on work clothes in industrial laundering

STREAM POLLUTION——R H Souther reported for the Committee on Stream Pollution, which has been preparing an Industrial Waste Guide for the Cotton Processing Industry. For this work the Committee would appreciate having more case histories, and asks that anyone who has recently commenced treating waste advise the Committee of his experiences.

ATMOSPHERIC FADING——V S Salvin reported for the Committee on Atmospheric Fading as follows:

"The Committee has critically examined the proposed test procedures for gas fading advanced as ISO methods by Germany and England. The present AATCC procedure is recommended for adoption as the ISO standard. It possesses advantages over other ISO proposals in:

a) greater duplicability,
b) flexibility to give more than one cycle of exposure,
c) better assessment of standard exposure time through use of standard test ribbon and vat dyed comparison standard,
d) less attention by technician.

"Data obtained on "O"-fading changes during service tests on dyed acetate and Dacron demonstrate that "O"-fading changes of the disperse dyes are inversely proportional to severity of changes due to oxides of nitrogen fading. Preliminary results suggest that "O"-fading is less pronounced in storage in closets than in

exposure under drapery conditions. Supplementary "O"-fading exposure tests will be set up for direct comparison of closet storage and window-exposure conditions.

"With the objective of obtaining a more rapid test procedure, which would decrease time cycle to 4 to 6 hours, an experimental program has been set up. It will involve enrichment of the nitrogen oxides content of combustion gases through catalytic effect of metallic screens, ie, copper, nichrome, platinum nickel."

At the conclusion of this report, Chairman Sylvester asked for approval of TCR to submit the proper forms to ISO for a recommended test for gas-fume fading.

WRINKLE RESISTANCE——E R Kaswell reported for the Committee on Wrinkle Resistance, which is now ready with a revision of the present test. It is expected that improved consistency of results will be possible. One more step will be to consider a 500-gram weight instead of the 1.5-pound weight.

ANTISTATIC FINISHES——S N Glarum reported for the Committee on Antistatic Finishes as follows:

"The AATCC Antistatic Committee is continuing its study of the aging characteristics of antistatic finishes with the goal of developing an accelerated aging test. The first step in this program was to collect a large mass of data on the effects of aging treated fabrics of several fibers under widely varied conditions of storage. This was done, and at first the results appeared to add to the confusion rather than reduce it. Members of a task group have been working on the data for the past several months and the reports presented yesterday indicate an approach that may bring order out of chaos. A program has been laid out to obtain additional data that are needed to test the validity of the proposed method of analyzing the data. If this works out as expected, the way should be clear for the development of accelerated aging tests.

"One problem that has been encountered is the unexpectedly good durability of the antistatic agents under normal storage conditions. This has required making normal storage tests over a very long period, in fact they are still being carried on, to provide data for correlation with accelerated tests.

"The present chairman of the Antistatic Committee is retiring, and the Committee voted unanimously yesterday to recommend to the Technical Committee on Research that Mr Fred Steiger be appointed to the chairmanship.

"The retiring chairman wishes to take this opportunity to express his thanks to the members of the Antistatic Committee for their cooperation. This Committee has been extremely active. Members as well as others have shown a great deal of interest in the work and have given their full cooperation. All meetings have been well attended and discussions have been very lively. Serving as chairman has been a pleasure."

BLEACHING——G M Gantz reported for the Committee on Bleaching as follows:

"Combining the tentative test methods for Ash Content and Non-Cotton Content under the heading 'Determination of Impurities in Bleached Cotton' has not been completed, but this will be ready for review at the next meeting.

"Considerable work has been done by Committee members on two capillary rise procedures for determining absorbency of bleached cotton fabrics. Further work is in progress and it is hoped a tentative decision can be reached at the next meeting as to the preferred method.

"The results of several laboratories on the fluidity of a new series of fabrics collected by Mr Black were discussed. Discrepancies in both Cuam and Cuen results were noted even though the two methods seemed to correlate well. Some doubt still exists as to the validity of results by the newer Cuen method. The committee plans to retain both test methods until a thorough scientific study settles this question.

"Mr Shanley reviewed previous work by the Committee on methods of Whiteness Determination. A spectrophotometric method was dropped after considerable work because it was not sufficiently sensitive. Recent work on cloth whiteness standards has been discouraging because of the difficulty of preparing such standards, their poor aging qualities, and the probability that mills would not actually use such standards.

"Recent developments in the field of reflectance photometers are encouraging. It is possible that a two-filter reflectometer would be reasonable in cost ($600-800). Such an instrument would measure both lightness and hue. By use of a scrambler device to minimize texture effects, and a fluorescence attachment to respond to brighteners, this one instrument should be useful for testing a variety of bleached and finished fabrics. The committee plans to continue evaluation of various fabric samples by means of multipurpose reflectometers and follow the development of a new reflectometer now being constructed by Mr Hunter."

WASHFASTNESS——P J Fynn reported for the Committe on Washfastness. He mentioned the work on a special test for the materials in carpets and rugs. Work is also continuing on the combined fastness to washing and light tests.

The End-Use Committee requests work on a special test for end-use washfastness for goods designed for Industrial Clothing. A large part of this work on 12 fabrics is now underway.

Chairman Sylvester asked for approval of Mr Ralph Smith as observer on the ASTM-AATCC joint committee on Washing of Tufted Carpeting.

NON-WOVEN FABRICS——K Barnard reported for the Committee for Non-Woven Fabrics. This is a joint committee of ASTM and AATCC. Problems of delamination, discoloration, and sewability are under consideration at the present time.

RADIO-ACTIVE TECHNIQUES——Mr Barnard also reported for the Committee on Radio-Active Techniques. (This report appeared on page P933 of the December 17, 1956 issue of ADR.)

COLORFASTNESS TO LIGHT——J Norton reported for the Committee on Colorfastness to Light as follows:

"The Lightfastness Committee met at 1:00 PM on November 15, 1956 with nineteen members and visitors present.

"The chairman reported briefly on the discussion and action taken at the ISO meetings in New York City in September. Because of the considerable difference in the standards and the point of fading at which assessment is made, the USA delegation could not accept the ISO Method as the only method for lightfastness testing.

"To accept only their method would have at least by implication made it necessary for American manufacturers to change all of the ratings presently in use and published. Also the method of rating at a color change at both grades 4 and 3 of the grey scale is in conflict with general practice in this country.

"The rating at a grade 3 color

change would be on the basis of considerably more change in color than is considered practical on an end-use basis.

"It was therefore decided at the ISO meetings that two alternate methods were necessary; one employing the continental standards and method of evaluation and the other, the AATCC standards with ratings based on a color change of grade 4 of the grey scale.

"We of the Committee are in agreement that the sunlight method in which samples are exposed only between 9 AM and 3 PM is more reproducible than a daylight method in which the samples are left in the cabinet 24 hours per day. We do, however, believe the daylight method is more realistic in terms of end use as well as being faster in obtaining results. For these reasons we will go along with the ISO on the basis of a daylight test but using our standards and methods of evaluation.

"A proposed draft of our alternate ISO Method was submitted to the members of the Lightfastness Committee for study, criticism and comments. As soon as agreement has been reached in the Committee, it will be submitted to ISO as an alternate method of daylight exposure.

"While we are not quite ready to propose a new daylight method to replace our present sunlight method, it now appears likely that this will eventually be done and the proposed ISO method was written with this in mind.

"Work is now being done in evaluating exposures of AATCC and ISO standards with the hope that we can eventually supply a conversion chart between the two sets of standards.

"The Special Task Group under the Chairmanship of C H A Schmitt has now about completed exposures on approximately 60 fabrics and standards at four locations; Chicago, Miami, Phoenix, and Sarasota. Exposures at the four locations by both the daylight and sunlight methods show general good agreement when all samples for each material are exposed to the same number of Langley Units at each location and by both methods. There are a few dyeings, which for want of a better or more informative term we are calling moisture-sensitive, that exhibit some differences in fading under varying exposure conditions. While the differences of this group are comparatively minor, usually less than one grade, we do have some ideas on the cause and will run a few additional exposures to check our theory.

"For general practical purposes, it now appears that either the use of the AATCC standards or the exposure to a total number of Langley Units can be used satisfactorily for rating lightfastness.

"Negotiations are now progressing to present a paper on this subject at the March meeting of the Society of Automotive Engineers in Detroit.

"Mr Rizzo reported on comparative fading results of the old and new lot of AATCC standards. Both lots are in general good agreement and preliminary work indicates that on our standards 1800 Langley Units of daylight exposure are equivalent to 20 standard fading hours in the Fade-Ometer.

"Mr Seibert, our AATCC research associate, reported briefly on studies in correlating Fade-Ometer hours with various lighting intensity levels of both incandescent and fluorescent lighting lamps. This work will be completed shortly and we hope to publish it in the very near future."

COLORFASTNESS TO CROCKING———H R Millson reported for the Committee on Colorfastness to Crocking as follows:

"It has been demonstrated that the reproducibility of dry crocking is to within one-half unit. The wet crocking tests varied considerably and will be further investigated. The level of the present test is considered severe and will be reviewed. Mechanization of the machine is being considered. The #1 AATCC wash test is being considered as a measure of the permanence of the stain received from crocking."

IDENTIFICATION OF FINISHES———B Norwick reported for the Committee on Identification of Finishes as follows:

"At the time of the last meeting of the Technical Committee on Research, I outlined the approach being taken by the group on the Analysis of Finishes. It was pointed out that, with the newer methods, small samples could be and were being correctly analyzed for such materials as Zelan, melamine and carboxymethylcellulose, to mention only those in the previous unknowns. In the latest unknown, there was a mixture of a heterocyclic methylol ethylene urea, a silicone, and methylol stearamide, plus an amine hydrochloride catalyst. Naturally, the latter was all gone in the final fabric, and was not identified, though it could have been suspected. All other items were correctly noted by at least one of the laboratories, and three correctly identified the major constituent, the methylolethylene urea. It is unfortunate that only seven laboratories sent in reports on the unknown, and only three sent in pertinent comments on a general analytical approach which had been prepared by Thomas Miles of the Quartermaster Research & Development Command at Natick and myself. Nevertheless, the work is going ahead. Since much of the information being discussed and exchanged is not readily available, interested parties who are not members of the ASTM or AATCC task groups are possibly falling behind in this field.

"The present goal of the Committee is a method for waterproofers. We already have a rough tentative, and the intention is to circulate among the old members limited samples of waterproofed fabrics involving all of the current chemical types of commercial finishes. By a Chinese numbering system and double transfer, we hope no laboratory will know which sample is which until the analysis is over and results are compared. I am almost sure all will be correctly identified. My only doubt is that the method will be suitable for a laboratory which has not previously analyzed a series of known samples.

"The reason for this is that in many cases we are dealing with compounds whose structure is still something of a mystery, or at least, still a subject of polemic. In addition, many are mixtures.

"It is interesting to find that the so-called methylol cyclic ethylene urea was referred to by several names: Panalon Cr of DuPont, Zeset S of DuPont, Rhonite R1 of Rohm & Haas, Resloom E50 of Monsanto & Aerotex Resin EU of American Cyanamid—and there could, of course, have been others. It would be interesting to know if there is a good way to tell whether the finish was really the Panalon CR or the Zeset S type. Unfortunately, I have not analyzed fabrics which I knew to have these two treatments, but it is possible that if there is a real difference between these two products it would show up in the chlorine damage and in % N and HCHO. But only one laboratory showed micro analyses for % N and NCHO on purified extracts which led to the generic answer. It should be noted that no representative from DuPont, Rohm & Haas, Monsanto or American Cyanamid sent in an analysis. The 4 incorrect reports showed methylol melamine in one case, methylol urea in 2 cases, and one didn't say which amino constituent was present but correctly noted the low

resin add on for the excellent crease resistance. All, in other words, knew they had amino-aldehyde finish.

"We are anticipating soon to write up a method for most of the amino-aldehyde finishes for circulation among the task group members. I am personally working on a new approach and would appreciate receiving known, labelled fabric samples of some of the trickier finishes, such as mixtures of resin and reactant types, urea and melamine types, methyloated resins, glyoxal based types, and if there are actually any around, epoxy resin-treated, ketone, acrolein, or what have you. In return for the labelled samples, I will send back a copy of the report.

"Next year will be my last as the group chairman, and I hope at that time to have the committee submit two serious up-to-date methods for waterproofers and amino-aldehyde finishes, but even if this is not achieved, the cooperating laboratories will be well informed over and above published information. At the time of the last meeting in Philadelphia, I had hoped that enough interested people might be found so that we could tackle adhesives and lubricants, but these two types comprise such a tremendous variety that with the limited support the committee has had, no general attack on the problem has been advisable.

"Fortunately, workers outside of the textile industry are laying the groundwork for microanalytical determination of the chemicals involved, using eutectics, refractive indices, density infra-red, chromatography and other methods suitable for milligram and smaller quantities.

"One problem not yet suitably resolved is essentially textile in nature: the determination of finish material which does not seem to be functional, though it may be. For example, a small amount of lubricant may improve a poor finish, but the overall result may be just as stiff, harsh, cracky and subject to sewing holes as a proper finish without added lubricant. If one works with cotton, it means that the "cotton wax" must be carefully examined for foreign matter, such as paraffin, silicone, polyethylene oxide derivatives or fatty amides, etc, and the nature or the frictional properties of the extract must be examined. Similar comments apply to all fiber where native extractibles may exceed the effective finish. You may ask why one should bother to analyze for an ineffective finish. The answer is simple. It may be your own.

"It is probably significant that the 3 laboratories with the best reports all included detailed physical tests on construction, strength and wrinkle recovery. Several did chlorine damage, and found it to be extensive, despite the claims that are made for cyclic ethylene urea. Now this information is really a clue, at least to some of us.

"An important, possibly major problem, is that of recognizing the presence of a finish, and only experience will help for a good many. In some cases, no specific residual chemical is associated with the finished textile, as with calendering, decating, sanforizing, heat setting, sponging, mercerizing, yet these operations are basic in the resulting finish.

"I hope that the group will continue its work and tackle such problems. If you know of any bright and industrious technical men in your organizations who are interested in these problems and are prepared to do a little extra work, I would be glad to hear from them."

Mr Norwick was appointed an observer on the ASTM-AATCC joint committee.

ENZYMES FOR DESIZING—— P Seydel reported for the Committee on Evaluation of Enzymes for Desizing as follows:

"To date, this Committee has gathered a bibliography for reference on this subject, and has approved analytical methods as standards for checking results of desizing. Subcommittees have been set up with the goal of devising laboratory methods of enzyme desizing simulating conditions in pad-and-lie, beck and continuous desizing. It is planned to check these methods against actual mill results.

"For analysis of cloth before desizing, the Federal Specification CCC-T-191b, Method 2610, 'Nonfibrous materials in cotton, acid method,' is approved. For analysis after desizing, the perchloric-acid anthrone method is approved.

"The reason two methods are specified is that the CCC-T-191b was found to be more accurate at high percentages of size and the perchloric-acid-anthrone more accurate at the low percentages found after desizing. Since the former is a different method, any error is highly multiplied at low starch concentrations. The latter method, although a direct method, is not highly accurate, and is therefore valuable principally when the error of a difference method becomes rather large."

Dr Seydel asked for millmen for work on this committee.

DIMENSIONAL CHANGES—— H Donaldson reported for the Committee on Dimensional Changes. It has been shown by work of a subcommittee that test 40-52 is satisfactory for determining the shrinkage incurred in hand washing or in the commercial laundry equivalent of hand washing.

Respectfully submitted,

J A WOODRUFF, *secretary*

AATCC Calendar

COUNCIL
Mar 29 (Roanoke, Va); June 7 (New York)

NATIONAL CONVENTIONS
Nov 14-16, 1957 (Hotel Statler, Boston); 1958 (Hotel Conrad Hilton, Chicago); 1959 (Sheraton Park and Shoreham Hotels, Washington, D C); 1960 (Philadelphia, Pa); 1961 (Buffalo, NY)

HUDSON-MOHAWK SECTION
Mar 29 (Johnstown, NY); May 17 (Ladies Nite—Schuyler Meadows, Albany, NY); June 21 (Outing—Antlers Country Club, Amsterdam, NY)

MID-WEST SECTION
February 16 (Hotel Bismarck, Chicago, Ill)

NEW YORK SECTION
Mar 1 (Hotel Delmonico, New York, NY); Apr 26, May 24—ladies nite (Kohler's Swiss Chalet, Rochelle Park, NJ); June (Annual Outing)

NIAGARA FRONTIER SECTION
Mar 15 (Buffalo, NY); Apr 5 (Joint meeting with CATCC at Kitchener, Ont)

NORTHERN NEW ENGLAND SECTION
Mar 1 (Boston area); May 3 (Lowell Tech Inst, Lowell, Mass); Sept 13 (Outing—Wachusett Country Club, W Boylston, Mass); Dec 6 (Annual meeting, Hotel Vendome, Boston, Mass)

PIEDMONT SECTION
Mar 30 (Hotel Roanoke, Roanoke, Va); June 7-9 (Outing—Mayview Manor, Blowing Rock, NC); Sept 28 (Hotel Barringer, Charlotte, NC)

RHODE ISLAND SECTION
Jan 31 (Johnson's Hummocks Grille, Providence, RI)

SOUTHEASTERN SECTION
Feb 22 (Pepperell, Ala); Apr 13 (Lindale, Ga); June 6-8 (Outing—Radium Springs, Ga); Sept 14 (Columbus, Ga); Dec 7 (Atlanta, Ga)

WESTERN NEW ENGLAND SECTION
Mar 15 (Rapp's Restaurant, Shelton, Conn); May 17 (Ladies Night—Waverly Inn, Cheshire, Conn); June 14 (Outing—Wallingford, Conn); Sept 27 (Rapp's); Nov 1 (Annual meeting—Hartford area); Dec 13 (Rapp's)

DERBY APPOINTED AATCC TREASURER

ROLAND E DERBY, president of Textile Aniline and Chemical Co, and vice-president of The Derby Co, Lawrence, Mass, has been appointed treasurer of the American Association of Textile Chemists & Colorists.

Mr Derby was installed in his new post with the AATCC, at the January 18th Council meeting in the Statler Hotel, New York. Mr Derby succeeds Albert E Sampson, National Aniline Division, Allied Chemical & Dye Corp, Boston, Mass. Mr Sampson resigned as treasurer as of Jan 1, 1957, after many years' service to AATCC in that post.

Mr Derby has been connected with AATCC since 1921, the year the Association was founded. Although as a student at Lowell Textile School he was still too young to be a senior charter member of AATCC, he was one of the original group of junior members in the group, and later transferred to senior status.

He has served the organization as chairman of the Northern New England Section, national councilor, and national vice-president. He has also served on many Association committees, including a number of research groups, and has presented papers before several sections of the AATCC, the Canadian Association of Textile Chemists & Colorists, and at Lowell Technological Institute.

Roland E Derby

In 1953, Mr Derby was the recipient of the Olney Medal, highest award of AATCC.

He has been president of the Lowell Technological Institute Research Foundation, a member of LTI Building Foundation, and has served as a trustee of the Institute.

Mr Derby's business career began in 1922 after his graduation from LTI, when he became assistant chemist at Lowell Bleachery. He then went to Merrimack Woolen Co as overseer of dyeing, and then from 1923 to 1927 was superintendent of dyeing at Lowell Dye Works. He then rejoined Merrimack Woolen in 1927, and in 1928 that firm was purchased by M T Stevens & Sons Co.

He became head chemist of M T Stevens in June, 1928, and held that position until 1940, when he established The Derby Co, Inc, a service laboratory, of which he is now vice-president, and Textile Aniline and Chemical Co, a dyestuff and chemical sales organization, of which he is president.

He holds several patents, and during World War II did work for the US Navy in the field of practical applications of soluble vats to piece dye work for indigo shades.

Mr Derby lives at RFD 2, Lowell, Mass. His family is composed of his wife, Ardelle; his son, Roland E Derby, Jr, president of The Derby Co; and a daughter, Mrs W J Taylor.

Mr Derby's avocations include photography, farming, hunting, fishing and flying. He is a licensed pilot, and operates both his own plane and a company ship.

In his post as treasurer of the AATCC, Mr Derby will also be a member of several important Association committees, including the Appropriations Committee and the President's Advisory Committee.

Cationic Softeners———

(Concluded from Page P57)

Product 10, the nonionic softener, appears to rank well with the cationics except in those properties which are dependent on polar charge.

LITERATURE CITED

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(5) Swillens, P, *Rayonne* **4**, #5, 107-11 (1948).
(6) Ackley, R R, *Am Dyestuff Reptr* **34**, August 27, 1945.
(7) Binns, H, *British J Psychol* **16**, 237 (1925-26); **27**, 404 (1936-7).
(8) Bogaty, H, Hollies, N, Harris M, *Textile Research J*, **XXVI**, #5, May 1956).
(9) ASTM Manual on Quality Control of Materials—Committee E11, Special Technical Publication 15-C, January, 1951.
(10) Kendall, M G, "Rank Correlation Methods", London, C Griffin (1948).

APPENDIX A

Fabric Construction Details

Acrilan	56 x 42
Arnel	66 x 27
Cotton	80 x 80
Nylon	40 x 40
Rayon	84 x 63
Wool	67 x 62 (Twill)

ACKNOWLEDGEMENTS

The committee gratefully acknowledges the cooperation of the following organizations in the preparation of this paper:—

American Cyanamid Co
American Viscose Corp
Armour & Co
Arnold Hoffman & Co, Inc
Atlas Powder Co
Celanese Corp of America
Chemstrand Corp
E I du Pont de Nemours & Co, Inc
Julius Forstmann Co
General Aniline & Film Corp
Hellwig Dyeing Corp
Hercules Powder Co
Laurel Soap Mfg Co
Millville Mfg Co
Onyx Oil & Chemical Co
Philadelphia Textile Inst
Procter & Gamble Co
Quaker Chemical Products Co
Refined Products Corp
Rohm & Haas Co
Scholler Brothers Inc
Jacques Wolf & Co

Also to Mrs Winifred Smith and John Roughan for their assistance in conducting and interpreting seam strength tests.

IMPORTANT ANNOUNCEMENT TO THOSE DESIRING THE SECOND EDITION OF THE COLOUR INDEX

The Copyright Office of the USA in Washington, DC, has informed the Association it will only permit them to import 1500 sets of the *Colour Index* now being processed and printed in England. Such a limitation means those who delay will be obliged to secure their set by the more expensive procedure of personal importation.

Deliveries will be made volume by volume on or about the following dates:

Volume I —Part I —February, 1957
Volume II —Part I —April, 1957
Volume III—Part II —September, 1957
Volume IV—Part III—March, 1958
from such advices as have come to hand.

Subscriptions will be taken by the Association from February 1, 1957 to May 1, 1957 at $99.00 delivered on the unsubscribed sets permitted for importation and distribution. After that date should any sets be available it is anticipated the price will be substantially advanced.

To insure the prompt and most economical delivery of the various volumes as issued, we suggest those interested send their subscriptions with their checks for $99.00 to

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Lowell, Massachusetts

Subscriptions will be processed in order of receipt until the Association allotment is exhausted.

COLOUR INDEX MARKETING COMMITTEE

Employment Register

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.

57-1

Education: Lowell Technological Institute, Lowell, Mass, BS, textile chemistry & dyeing.
Experience: 5½ years sales service; dyer.
Age: 31; married; veteran; references.
Position Desired: Chemist & technical representative with dyestuff or pigment manufacturer.
Locations: New York, New Jersey area preferred. Eastern seaboard ac-

Future Papers

The following material has been submitted to date to the publishers of American Dyestuff Reporter. Subject to the approval of the AATCC Publications Committee, it will appear in the Proceedings in future issues.

Authors, section officials, and committee chairmen are requested to inspect this list and notify the publishers if there are any omissions.

Papers presented at the Perkin Centennial under AATCC sponsorship:

"The Development of Fast Colors for Textiles" — F M Fordemwalt, American Cyanamid Co

"The Development of the Art of Textile Printing"—Herman P Baumann, American Aniline Products, Inc

"The Development of Modern Textile Dyeing Techniques"—P L Meunier, E I du Pont de Nemours & Co, Inc

"The Application of Colorants to Glass Fibers"—R F Caroselli, Owens-Corning Fiberglas Corp

"Internal Application of Colour in the Manufacture of Man-Made Fibers" —C E Coke, et al, Courtaulds, Ltd

"The Sulfur Dyes"—J L Crist and R E Rupp, Southern Dyestuff Corp

Papers presented before local sections:

"Far Infra-red for Textile Dyeing and Finishing"—W L Thomson, Edwin L Wiegand Co

"Lighting Factors to be Considered in Textile Color Matching"—Warren B Reese, Macbeth Daylighting Corp

"Progress in the Art of Bleaching" —B K Easton and N Weinberg, Becco Chemical Division

"Binders for Nonwoven Fabrics"— Neil H Sherwood, B F Goodrich Research Center

"Technology of Nonwoven Fabrics" —L G Lovin and L P Wenzell, Celanese Corp of America

"Developments of Science and Industry in the South"—Frank J Soday, The Chemstrand Corp

"Random Tumble Pilling Tester"— A G Scroggie, E I du Pont de Nemours & Co, Inc

"Recent Developments in Vat Dyeing"— J M Fletcher, E I du Pont de Nemours & Co, Inc

Miscellaneous:

"The Interaction of Cellulose with Simple Salt Solutions and with Dyebaths"—Mary Moncrieff-Yeates and Howard J White, Jr

"Leucoesters of Vat Dyestuffs"— Hans Luttringhaus, Progressive Color & Chemical Co

Other Perkin Centennial Papers

"A Century of Progress in Colorfastness Test Methods"— M L Staples, Ontario Research Foundation

"The Standard Depth of Shade in Relation to the Assessment of Colorfastness of Dyes on Textiles"—Paul

"Dyes and Dyeing Processes for Special Properties of Color"—J S Kirk, General Dyestuff Co

"Progress in Measuring Color Difference" — G W Ingle, Monsanto Chemical Co

"The Use of Color in National Defense"—S J Kennedy, Quartermaster Research and Development Command Rabe, Farbenfabriken Bayer AG

"Seeing Light and Color"—Ralph M Evans, Eastman Kodak Co

"The Chemistry of Organic Pigments"—A Siegal and W S Struve, E I du Pont de Nemours & Co, Inc

"Color in Relation to the Political and Economic History of the Western World"—S M Edelstein, Dexter Chemical Corp

"Color in Ancient Times"—Earle R Caley, Ohio State Univ

"Color Designation through the Ages"—Ernest R Kaswell, Fabric Research Laboratories, Inc

"America's Debt to Perkin"—Samuel Lenher, E I du Pont de Nemours & Co, Inc

"Early Synthetic Dyes"—Hans Z Lecher, consultant

"Synthetic Dyes for Cotton"—D I Randall, General Aniline & Film Corp

"Dyes for Animal Fibers"—James Ogilvie, National Aniline Div

"Dyes for the Hydrophobic Fibers" —H E Schroeder and S N Boyd, E I du Pont de Nemours & Co, Inc

"Fluorescent White Dyes"—Robert S Long, American Cyanamid Co

"The Theory of Dyeing Cellulosic Fibers"—Emery I Valko, Onyx Oil & Chemical Co

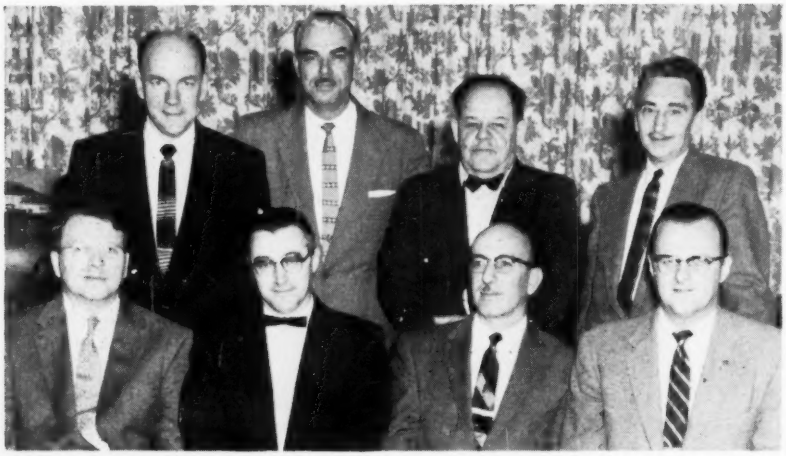
"Theory of Dyeing Polyester and Polyacrylic Fibers"—W R Remington and H E Schroeder, E I du Pont de Nemours & Co, Inc

Activities of the Local Sections

Western New England

A MEETING of the Western New England Section was held on Friday, November 16, 1956 at Rapp's Restaurant, Shelton, Conn, with approximately 50 members and guests in attendance.

Guest speaker of the evening was Fernand Schlaeppi, chief New England technician for Ciba Co, Inc. Mr Schlaeppi spoke on "Some Aspects of Dyeing with Premetallized Colors." His talk was illustrated with colored slides and a Technicolor movie.



WNE SECTION OFFICERS—1957

Seated (l to r): **P DuBiel, Cheney Bros, treasurer; T J Gillick, American Felt Co, chairman; J Cervini, Cheney Bros, vice chairman; A W Goodwin, Princeton Knitting Mills, secretary.**

Standing (l to r): **P Reeves, Princeton Knitting Mills, sectional committeeman; R J Carey, General Dyestuff Co, councilor; E Otto, Frank H Lee Hat Co, sectional committeeman; A H Rant, Laurel Soap Mfg Co, sectional committeeman.**

E J Lynn, consultant, councilor, and G Perkins, Southern Dyestuff Corp, sectional committeeman, were not present at the time photo was taken.

WNE SECTION MEETING OF NOV 16, 1956

HEAD TABLE

(L to r): **A H De Marco, Shelton Hosiery Mills, treasurer; T J Gillick, Jr, American Felt Co, chairman; Fernand Schlaeppi, Ciba Co, Inc, speaker; J E Hirn, National Aniline Div, vice chairman.**

PART OF THE AUDIENCE

Delaware Valley

Prof P Theel (right) accepts check for $250 for the Philadelphia Textile Institute from Thomas H Hart, '56 chairman of the Philadelphia Section, during the December 7th meeting. The check represents the amount realized on the most recent course given by the Section's Educational Committee at PTI, bringing the donations to $2,500.

THE Delaware Valley Section (formerly Philadelphia) held its first meeting of 1957 on Friday, January 11th at the Drake Hotel, 1512 Spruce St, Philadelphia, Pa.

Speakers of the evening were Walter H Hindle of The Chemstrand Corp and Arthur G Scroggie of E I du Pont de Nemours & Co, Inc. Mr Hindle discussed the Chem-nyle Process for dyeing of filament nylon in the yarn, package, woven piece, knit piece and half hose form. He illustrated his talk with various exhibits. Dr Scroggie, in presenting his talk, "A New Instrument for Evaluating Pilling Propensity in Fabrics," also illustrated his talk with exhibits and slides.

Thomas H Hart, Hart Products Corp, outgoing chairman of the Section, congratulates Donald W Robinson, Para-Chem, Inc, Delaware Valley Section chairman for '57.

Donald W Robinson, Para-Chem, Inc, new chairman of the Section, presented a watch to outgoing chairman Thomas H Hart, Hart Products Corp, on behalf of the Section for his fine leadership during 1956.

The next meeting of the Delaware Valley Section will be held on Friday evening, March 8, 1957 at the Bellevue-Stratford Hotel, Philadelphia.

DELAWARE VALLEY SECTION OFFICERS—1957

Seated (l to r): Percival Theel, PTI, chairman emeritus; William S Sollenberger, American Viscose Corp, vice chairman; Donald W Robinson, Para-Chem, Inc, chairman; Ernst W Empting, General Dyestuff Co, secretary; Albert E Stutzke, Globe Dye Works Co, treasurer.

Standing (l to r): Richard A Shimp, E I du Pont de Nemours & Co, Inc, councilor; Kevin McChesney, Leatex Chemical Co, sectional committeeman; William H Bertolet III, Laurel Soap Co, councilor; Arthur E Etchells, Hellwig Dyeing Corp, councilor; Clarence A Seibert, Scholler Bros, councilor.

Clarence Seibert (2nd left), Program Committee chairman, and Donald W Robinson (3rd left), Section chairman, greet Arthur G Scroggie (left), E I du Pont de Nemours & Co, Inc, and Walter H Hindle (right), The Chemstrand Corp, guests speakers at the January 11th meeting of the Delaware Valley Section.

NOTICE

To ensure that the activities of your Section receive proper publicity in the Proceedings, it is desirable that material be submitted direct to American Dyestuff Reporter, 44 E 23rd St, New York 10, N Y.

ADVANCE NOTICES OF MEETINGS———Copy must be submitted *at least two weeks* prior to the publication date. ADR is published on alternate Mondays. It is urged that that dates be taken into consideration when copy is submitted.

Advance notices should include the date and site of the meeting; the speaker's name, position, business affiliation, and subject; a short abstract of the paper (optional); details of additional meeting highlights, eg, nominations or election of officers, special awards, activities of Sectional committees, etc.

MEETING REPORTS———Complete reports should be submitted as soon as practical after a meeting. Information should include attendance figures; captioned photographs of meeting principals (speaker, section officials, etc); and any additional points not covered in the advance notice. An extensive resume of the speakers' remarks is not necessary if the paper is to be submitted for full publication in the Proceedings.

PAPERS———Two copies of each paper presented before local sections should be sent to the offices of the American Dyestuff Reporter. It is very important that every speaker be acquainted with the "Notice to Authors", which appear periodically in the Proceedings. Additional copies of said notice will be sent to section officials on request.

It is imperative that each Section appoint an official whose responsibility it is to see that the speaker's remarks are submitted. In cases where prepared manuscripts are not immediately available to the Section official, it may be necessary to acquaint the author with the address to which he should send his material when it is finally prepared.

In cases where the material is extemporaneous (panel discussions, question-and-answer periods, open forum, etc) it is the responsibility of the Section to provide for stenotype service, so that a complete record may be available.

PRESENTATION OF A PAPER BEFORE A LOCAL SECTION DOES NOT GUARANTEE PUBLICATION IN THE PROCEEDINGS. AS THE FINAL DECISION RESTS WITH THE AATCC PUBLICATIONS COMMITTEE. However, most papers will be acceptable provided they conform in content and layout to established practices of AATCC.

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News of the Trade

Verona Purchases Entire Pharma Stock

Verona Chemical Co, Newark, NJ, has purchased the entire outstanding capital stock of Pharma Chemical Corp. Pharma will continue its operations as a subsidiary of Verona Chemical Co.

Askin

Schlesinger

Heyden and Newport Combine Assets and Business

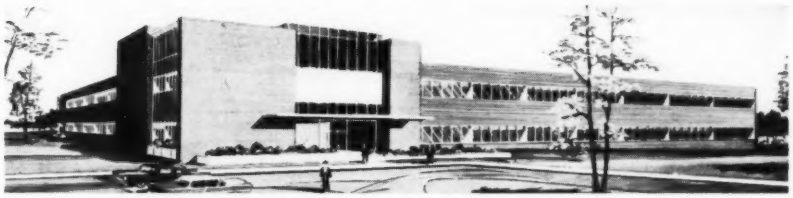
Heyden Chemical Corporation and Newport Industries, Inc have combined their assets and business. Heyden has acquired the assets of Newport and changed its name to Heyden Newport Chemical Corporation.

Simon Askin is president and chief executive officer of Heyden Newport Chemical Corporation. Armin A Schlesinger, former chairman of the board of Newport Industries, Inc, has been elected chairman of the board, and John P Remensnyder, vice-chairman.

Heyden and Newport had total sales of approximately $46,500,000 in 1955. For the first nine months of 1956 total sales were approximately $34,500,000; total assets in 1956 were about $60,000,000.

The Heyden board has been enlarged to include seven members designated by Newport in addition to the nine Heyden directors. The business of Newport will be continued under its present operating management as Newport Industries Company, a division of Heyden Newport. E F Sisson will be president and S J Spitz, executive vice-president of the division. Both Mr Sisson and Mr Spitz have also been elected vice-presidents of Heyden Newport.

Heyden is a major producer of pentaerythritol, formaldehyde and other chemicals important in the protective coatings and plastics industries. Newport is the second largest producer of naval stores and a pioneer producer of tall oil products and fine chemicals from wood sources.



Artist's conception of Atlas Powder Co's Technical Center

Atlas Powder Breaks Ground for New Technical Center

Atlas Powder Company broke ground on January 17th for a $3,000,000 Technical Center which will enable the company to intensify its long-range basic research program as well as to expand its technical service to the textile industry.

The new center will be located adjacent to the company's general offices in a suburban area near Wilmington, Delaware. It is scheduled for completion by the end of this year.

Delaware's Governor J Caleb Boggs removed the first spadeful of earth to mark the start of the project, with Atlas President Ralph K Gottshall using a pick-ax to assist.

Mr Gottshall said the new Atlas Technical Center is the latest step in the current expansion of the Atlas research and development program, which includes an intensification of long-range research as well as applications research and customer service. Within the next few years, he said, Atlas plans to approximately double its research and development strength.

The Technical Center will provide extensive facilities for work across the entire range of applications served by Atlas products, including sorbitol, emulsifiers, detergents, polyester resins, activated carbons and explosives.

For the near future, Mr Gottshall said, this will mean more technical help for the company's customers on their own new problems. In the not-too-distant future, he said, the company hopes it will mean more and better Atlas products and services, both for the many markets already served by the company and for other existing markets, as well as for new markets which may grow out of research.

Following completion of the new center, technical studies and product development activities now being carried on at the company's Central Research Laboratory at Atlas Point, Delaware, will be transferred to the new building, along with personnel of the company's Research and Product Development Departments who are now located in the general offices. The building is designed to provide working space for 200 employees.

The company's Chemical Engineering Department, which now operates pilot plant installations at the Central Research Laboratory, will take over all of that facility after the other departments move. No production or pilot plant activities will be carried on in the Technical Center.

Both design and construction of the new building is being carried out by H K Ferguson Company, Cleveland, Ohio. The same firm built the company's general office building two years ago.

Atlas also operates the Reynolds Experimental Laboratory for explosives research near Tamaqua, Pa; the Darco Experimental Laboratory at Marshall, Texas, for research on activated carbons; and the Aquaness Department laboratory in Houston, Texas, for research on chemicals for the petroleum industry.

Du Pont to Construct New Chemical Plant at Carney's Point

Plans for the construction of a new chemical plant at Du Pont's Carney's Point Works in New Jersey were announced Jan 9 by the company.

The new unit will manufacture refined as well as technical grades of Sodium CMC (sodium carboxymethylcellulose), a synthetic gum with many industrial uses. Construction will start immediately with completion scheduled for early next year.

Since 1947 the Carney's Point Works has been producing technical grades of Sodium CMC. The addition of refined grades to Du Pont's Sodium CMC line will extend the range of industrial applications.

When the new plant gets into operation, the existing plant will be dismantled.

NYPC to Meet Feb 14

The New York Pigment Club will hold its regular monthly meeting on February 14, 1957, at 6:30 pm at Fraunces Tavern, Broad and Pearl Streets, New York, NY.

The guest speaker will be James H Taylor of the National Printing Ink Research Institute. His topic "Dispersions," will be followed by a twenty-minute film on the activities of the Institute.

NID Establishes Textile Analysis Advisory Committee

The National Institute of Drycleaning, Silver Spring, Md, has announced the establishment of a Textile Analysis Advisory Committee to meet periodically to act on policy and procedural recommendations concerning the operation of the Institute's Textile Analysis Laboratory. The members of the committee are: Charles W Dorn, textile consultant; Mrs Dorothy C Matthai, merchandise manager, Better Busines Bureau, Inc, Baltimore, Maryland; Charles A Seibert, formerly head of the Dye Properties Division of Du Pont's Technical Laboratory; and Miss Mary C Whitlock, professor and head of the Textile and Clothing Department, College of Home Economics, University of Rhode Island.

The committee held its organizational meetings January 10 and 11. It will meet again sometime in April.

NID's Textile Analysis Laboratory annually investigates more than 25,000 damage complaints it receives from members of the Institute, Better Business Bureaus and others. The laboratory reports the results of its findings and indicates the cause of damage. These reports become increasingly valuable in resolving controversies that arise in cases of garment damage in drycleaning or other service conditions.

The National Institute of Drycleaning will depend upon the Textile Analysis Advisory Committee for guidance in dealing with some of the more difficult types of complaints and for counsel in any textile and consumer relations programs it may undertake in the more important problem areas that arise.

The Institute also announces plans to publish periodically statistical reviews of its activities pointing up current trends in garment serviceability problems as an aid to its members and to the consumer and textile interests.

The Textile Analysis Laboratory was founded in 1927 with the opening of the Institute headquarters in Silver Spring. A branch laboratory—to serve Institute members west of the Rockies—was established in 1948 in Glendale, California.

The chief analyst in Silver Spring is W Clay Hardin; manager of the West Coast Branch is Brooklyn Harris.

NETF to Liquidate

At a meeting of the Executive Committee of the New England Textile Foundation in Providence, RI, on December 19, 1956, it was voted to liquidate. The Committee decided to do this because the Foundation does not wish to compete with any of the textile schools in New England who may decide to conduct their own fund-raising campaigns.

The New England Textile Foundation was established on Dec 5, 1944 and has been active in the support and encouragement of textile education since 1946. Its program has been:

1) Subsidization of faculty and administrative salaries in the textile colleges of New England.
2) Modernization of equipment in these institutions.
3) Granting of scholarships to qualified and deserving students who wished to go to these institutions.

Over the years, the Foundation has donated close to $1,000,000.00 for all of these purposes, although in recent years its activities have been confined mostly to scholarships.

Before liquidating, the Foundation will discharge all scholarship obligations now in force and extending into 1960.

Funds remaining after that, which it is estimated will be about $75,000.00, will be divided among the four textile colleges in New England in direct proportion to their respective textile enrollments. "Textile enrollment" in this case includes students studying for a degree in textile engineering, textile manufacturing, textile chemistry or textile design (not including clothing design).

The beneficiaries of these grants will be Bradford Durfee Technical Institute, Fall River, Mass, Lowell Technological Institute, Lowell, Mass, New Bedford Institute of Textiles & Technology, New Bedford, Mass, and probably the Textile School of R I School of Design. The gift to Rhode Island School of Design will be contingent upon whether or not this institution will continue its textile course in some form or other. The Foundation points out that its Indenture prohibits it from making grants to any institution which does not give a course in textiles.

The members of the Executive Committee of the New England Textile Foundation are Abbot Stevens, formerly a vice president of J P Stevens & Co; Charles B Rockwell, president of the Allendale Co; C R Steedman, agent of Synthetic Yarns, Inc; Edward F Walker, secretary of Rhode Island Textile Association; Roland E Derby, treasurer of Textile Aniline & Chemical Co; Melville Weston, formerly president of Newmarket Manufacturing Co; and Trowbridge Horton, vice president of Industrial National Bank. George T Metcalf is executive secretary. The Headquarters of the Foundation are at 31 Canal Street, Providence 3, RI.

General Calendar

AMERICAN OIL CHEMISTS SOCIETY
Spring, 1957 (Spring meeting, New Orleans); Sept 30-Oct 2, 1957 (Fall meeting, Cincinnati); Apr 21-23, 1958 (Memphis); Oct 20-22, 1958 (Chicago); Spring, 1959 (New Orleans); Fall, 1959 (Los Angeles).

AMERICAN MATERIAL HANDLING SOCIETY
Apr 29-May 3 (7th Materials Handling Exposition, Convention Hall, Philadelphia, Pa)

AMERICAN SOCIETY FOR QUALITY CONTROL
Feb 25-27—7th Annual Conference of the Textile Division, Georgia Tech, Atlanta, Ga.

THE DRYSALTERS CLUB OF NEW ENGLAND
Apr 26 (Hotel Vendome, Boston); June 21 (Annual Outing—Wachusett Country Club, West Boylston, Mass).

THE FIBER SOCIETY
Spring Meeting—May 1-2, 1957, The Clemson House, Clemson S C; Sept 4-6 (Joint meeting with the Textile Institute—Hotel Statler, Boston, Mass)

NATIONAL ASSOCIATION OF HOSIERY MANUFACTURERS
NATIONAL KNITTED OUTERWEAR ASSOCIATION
UNDERWEAR INSTITUTE
April 29-May 3 (1957 Knitting Arts Exhibition, Atlantic City, NJ)

NATIONAL COTTON COUNCIL OF AMERICA
Feb 28-Mar 1 (Cotton Research Clinic, General Oglethorpe Hotel, Savannah, Ga). October 2-3 (Chemical Finishing Conference—Statler Hotel, Washington, DC)

PHI PSI FRATERNITY
April 25-27—Annual meeting, New Bedford Hotel, New Bedford, Mass.

PHILADELPHIA TEXTILE INSTITUTE ALUMNI ASSOCIATION
March 1 (56th Annual Banquet, Bellevue-Stratford Hotel, Philadelphia, Pa); June 6-8 (Alumni Day, Alumni Outing, PTI Commencement)

PURDUE UNIVERSITY
May 13-15 (12th Purdue Industrial Waste Conference, Purdue Univ, Lafayette, Ind)

SCALAMANDRE MUSEUM OF TEXTILES
Jan-Mar, 1957 (Exhibit—"Two Hundred Years of Textile Designs"

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Jan 8, Feb 14, Mar 12 (Palm Terrace Suite, Hotel Roosevelt, New York, NY); May 26-28 (Annual Outing, Skytop, Pa); June 11, Sept 10, Oct 8, Nov 12 (Palm Terrace Suite, Hotel Roosevelt, New York, NY)

TEXTILE QUALITY CONTROL ASSOCIATION
March 28-29 (Spring Meeting, Clemson House, Clemson, SC)

Infracord Spectrophotometer

Infracord Double-beam Spectrophotometer

A new low-cost double-beam infrared spectrophotometer has been announced by the Instrument Division of the Perkin-Elmer Corporation, Norwalk, Conn. Called the Infracord Spectrophotometer, it has been designed primarily for use by the organic chemist at his bench. The manufacturer believes that its low cost and simplicity of operation should appeal to small companies and laboratories who have not considered it feasible to purchase the more expensive infrared instruments presently available.

The Infracord spectrophotometer will sell for less than $5,000. This is believed to be about a third of the cost of double-beam infrared instruments now being marketed, and even less than the price of single-beam infrared instruments.

The instrument has considerable versatility. It may be used for fast purity checks of raw materials, for recording the progress of an organic synthesis, for molecular structure elucidation and for precise quantitative analysis.

The development of the Infracord spectrophotometer is of major interest to the chemist because of the considerable saving in time which results when infrared analysis is substituted for classical methods.

It is stated that a background in infrared instrumentation is not necessary to operate this new instrument, for it is far less complicated to us than an analytical balance. In essence, operation consists of putting a piece of chart paper on a drum, inserting the sample and pushing a start button. The unattended Infracord spectrophotometer will then record a permanent record, on 8½" by 11" notebook-size paper.

The instrument is a compact, self-contained unit which will fit atop a normal-sized desk. It measures 27½ inches long by 17 inches wide by 8½ inches high, and weighs 120 pounds. The only service required is a 120-volt, 60-cycle power source.

The Infracord spectrophotometer scans a spectral range from 2.5 microns to 15.0 microns. Resolution is 0.05 microns at 10 microns. It is stated that wavelength accuracy is 0.03 microns throughout the rocksalt region, wavelength reproducibility is better than 0.01 micron, noise level is ±1%, quantitative accuracy is 1%, and scattered light is less than 5% at 15 microns. There is no loss of wavelength accuracy when multiple curves are recorded on a single sheet of paper, it is claimed.

Several unique features have been incorporated into the instrument. These reportedly include a high-efficiency, light-gathering monochromator, and a newly designed radiation source with excellent stability and long life. The Infracord double-beam spectrophotometer is said to incorporate advanced methods of infrared instrumentation, previously available only in the most expensive instruments. Among these are cancellation of atmospheric background, minimization of stray light, and high resolution. The instrument is also equipped with manual slit adjustment for differential analysis.

Many of the standard Perkin-Elmer infrared accessories can be used with the new Infracord spectrophotometer. Special sealed cells, microcells, gas cells, and KBr disc holders will be available. Recording paper is available in either transmission or absorbence units. Space is provided on the paper for complete notation of sample identification and operating conditions.

In the operation of the instrument, a demountable, vertical recording drum permits fast and easy insertion of recording paper. The drum is directly coupled to the wavelength cam and positions itself automatically at the starting point. The instrument stops at 15 microns and no runback time is required. The drum is turned back manually to the starting position or any other wavelength of interest. The only operating controls are a switch to turn the instrument on, a start/stop switch, a 100% transmittance adjusting knob, and a manual slit control. The latter can be used for recording spectra at a slit program which automatically provides constant energy to the system, or for wider manually controlled slits operation.

The new instrument has been designed with preset operating parameters. It reportedly will perform routinely analyses now being carried out by more complex instruments.

GE Color Difference Calculator

Color differences barely visible to the human eye can be readily computed by a slide-rule calculator developed by a General Electric laboratory engineer, it is reported.

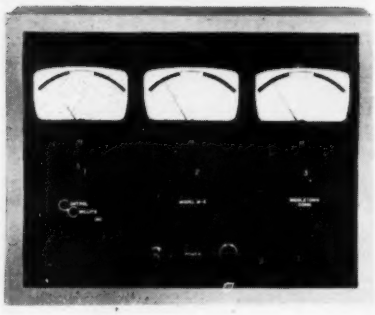
The color difference calculator, which computes a numerical value for the difference in color between two materials, is applicable to a variety of manufacturing processes.

Donald DeJager, a development engineer in GE's General Engineering Laboratory, says the advantages of the device over other methods are the ease and speed of computation and the elimination of the use of color tables.

Three characteristic numbers, i. e., tristimulus values, are obtained by spectrophotometric analysis of each material. These numbers provide the basic data needed to use the slide rule.

One setting of the movable slider automatically adds three vector quantities in a basic equation for color differences.

The method is based on the Adams Chromatic Value System, which combines a reasonable accuracy, in relation to visual estimates, with a simplified computation procedure.



Aquanalyzer

Aquanalyzer

A new control device of considerable interest to textile, laundering, chemical and other industries in which quantities of aqueous solutions must be reclaimed or continuously analyzed, is the Aquanalyzer, a product recently announced by Control Circuits, Inc, 103 Court St, Middletown, Conn.

According to the manufacturer, the device is an indicating system that compares the electrical resistance of water entering a tank with the resistance of water being released from the tank after use in a manufacturing operation. When the resistance of influent and effluent are equal, the Aquanalyzer actuates a relay and another operation can be automatically started. The control may be pre-set to operate at any desired differential or to any specific resistance setting. A continuous sampling of the fluid's resistance is obtained through use of specially designed conductivity cells placed at influent and effluent points. These cells transmit resistance readings to a central electronic control point where the readings are quantitatively analyzed and compared and where control of the device is centered.

Many features reportedly have been developed in this device that make the control sensitive to the slightest change in the solution. The cells are said to be free of any plating tendencies and are not affected by any other electrical currents in the solution, such as may be encountered in a plating tank. Several types of cells are available that can be installed readily in a pipe or tank. The design is said to be such that these cells cannot catch lint or solids. The control units are self-contained and may be wall mounted. Standard units are available that can individually control and indicate solution in one to five tanks.

The first industrial application of the new device is one installed in a woolen mill where the Aquanalyzer controls the flow of water used in a washing cycle. In an operation which requires exceptionally large quantities of heated water, the device is said to have effected a two-thirds savings in washing time and water requirements. The rinse water in this case is monitored and when the last trace of soap or detergent has been washed out of the wool and the rinse water is as clean as the incoming water, the device stops the washing process.

Photo shows a large centrifuge at Marriner Combing Co, repaired with one pound of Devcon, a product of Devcon Corp, Danvers, Mass. Estimated saving was $1,000 and several days of lost production time.

Devcon—"The Plastic Steel" is a combination of 80% steel and 20% plastic for use in repairing broken machinery. It is claimed that, two hours after the addition of a special hardening agent, the mixture becomes a rigid, tough, steel-like mass. Once hard, it can be sawed, drilled, threaded or ground with regular metal-working tools.

Devcon is of two types, putty and viscous liquid.

Eponite

A new resin that reportedly wrinkle-proofs white cottons, gives them a "wash-and-wear" finish and prevents discoloration, was announced recently by Shell Chemical Corporation, 50 W 50th St, New York 20, N Y.

The company's research affiliate, Shell Development Co, has been developing and testing the resin, trademarked Eponite, for over five years. The tests reportedly showed that the product will allow a housewife to wash, bleach and iron her white goods without fear of "yellowing" or loss of strength, as the resin does not react to the chlorine in bleaches.

Further experiments are said to have demonstrated that Eponite will keep a cotton garment wrinkle resistant for its life. After more than a year of wear and over 45 washings, men's shirts treated with the resin reportedly retained their initial crease resistance.

The resin also shows promise as finish for rayons.

FRL Temperature-Humidity tester for wool

New Temperature-Humidity Tester for Wool

A unique apparatus for determining the behavior of lightweight wool suitings under high temperatures and high humidities has been announced by Fabric Research Laboratories, Inc, Dedham, Mass.

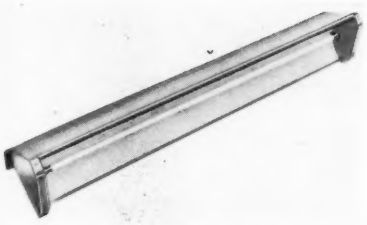
The device has been developed by FRL in part of a research program sponsored by The Wool Bureau, Inc. The basic preconstructed component, constituting essentially the entire temperature-humidity chamber, is an incubator originally constructed for the protection of premature infants. The basic unit's volumetric, temperature, and humidity capacities have been modified in order that the necessary textile testing equipment may be contained entirely within the temperature-humidity controlled chamber.

At the present time a maximum temperature of 95°F and a maximum relative humidity of 95% can be accurately achieved and controlled. The desired temperature and humidity are obtained by vapor pressure created in passing heated air over a tray of salt in solution.

New Service for Furs

While all furs can be beautiful in fair weather, a new process developed by The Cravenette Co, USA, Hoboken, NJ, reportedly makes it possible for furs to look their loveliest in all weather. Application of this new process is said to greatly improve the natural water repellency in all furs and matting and crushing is minimized even in such furs as beaver, Alaska seal, and mink.

This process can be applied both to new and to worn fur garments. In the case of worn garments, the process can be applied in connection with fur cleaning and fur storage.



Infralite Radiant Heater

Infralite Radiant Heaters

A new brand of infrared radiant energy, "intermediate infrared," has been incorporated in the newly developed infralite industrial radiant heaters of N J Thermex Co, Harrison, NJ. It is claimed that infralite installations have proven to be up to three and a half times more efficient than the bulbs or metallic elements. Each infralite heating element reportedly can provide energy of more than one hundred watts per inch of its heated length.

The intermediate infrared is that portion of the spectrum which lies between 1.7 and 3.0 microns. It is stated that, by shifting the wave length to the intermediate range, maximum efficiency results due to the increased absorption by practically all materials since losses from conduction, convection and visible light are considerably reduced. Intermediate infrared is absorbed to a greater extent by all colors and surfaces than any other wave length. Transmission through air and gases is said to be ideal with practically no loss to absorption.

The design of infralite makes it adaptable for use in ovens, all types of conveyors, portable units and panel installations. Infralite radiant heaters are manufactured in various sizes and installation is simple, requiring only two wires to be connected with heating capacities up to ten thousand watts or more.

Nopco Developments in '56

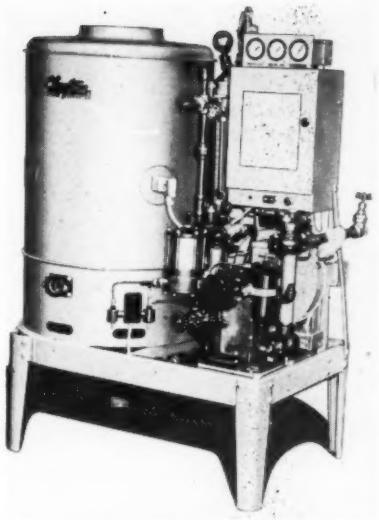
Among the products and methods developed by Nopco Chemical Co, Harrison, NJ, the following are of specific interest to the textile chemist:

Nopcosize® D-10 & Nopcosize N———When used in conjunction with Nopco's additive, Nopcolube® 55, these Dacron and nylon warp sizing combinations are said to eliminate top waxings so that sizing and lubricating are accomplished in one operation; eliminate shedding and flaking during weaving; give superior split, resulting in higher slasher speeds; and give cleaner goods. In addition, these combinations are said to be easily prepared and readily scoured and to require no stainless-steel equipment or Teflon-coated cans. The Nopcosize D-10 combination is intended for Dacron yarn, and the Nopcosize N combination, for nylon yarn.

Nopcone® LV———An antistatic lubricant which reportedly has low viscosity which imparts low fibre-to-metal friction. Its features are said to include outstanding scourability at low temperatures, very light color and excellent solubility. It is claimed that these properties, combined with its excellent resistance to yellowing and the fact that it will not cause dermatitis, make it ideal for stretch and bulk yarn as well as low denier mono- and multi-filament yarn.

Modicol® VD———A synthetic polymer latex thickener for rug and upholstery backing. An easy pouring, nonstringy liquid, it is said to work equally well with most synthetic latex emulsions. Three to four percent of Modicol VD added to an emulsion of 30% solids reportedly increases the viscosity from 25 cps to 800 cps. Thickened emulsions maintain a uniform, gel-free, high viscosity even at very low concentrations, it is claimed.

Soon to be test-marketed in a number of areas is this brand new Shetland weight sweater of 100% Darlan, B F Goodrich Chemical Company's new dinitrile fiber. Fashioned on hand frames by the Benjamin Moseley Company, the downy-soft sweater is said to be completely washable with no danger of shrinking, stretching, or color change. Darlan also makes the garment moth and mildew proof, it is claimed.



Clayton Forced-Circulation Generator

Increased HP in Clayton Generator

The Clayton Manufacturing Company's (El Monte, Calif) forced-circulation generator with balanced-feed design is now available in greatly increased horsepower rating.

Formerly offering a normal rated boiler horsepower of 15, these models are now also obtainable with a 30 HP rating. Maximum horsepower has also doubled, from 16.5 to 33 HP.

Normal BTU output at 33,475 BTU per HP therefore becomes 1,004,250 in normal operation. Normal steam output is 1,035 pounds per hour. These steam generators are designed with a pressure of 200 pounds per square inch.

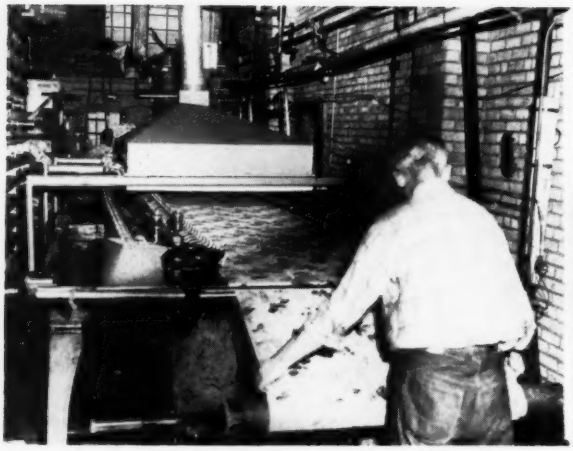
Clayton steam generators are used in cleaning and dyeing, laundering, textile processing, and other applications.

Turbo Demonstrating Finishing Machinery for High Pile Fabrics

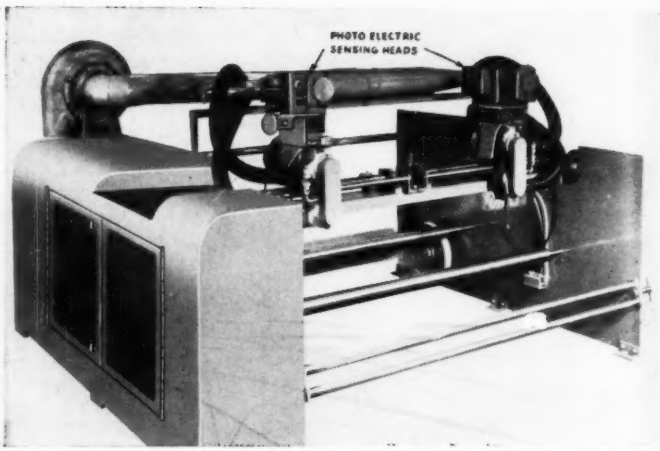
Turbo Machine Co, Lansdale, Pa, has completed a demonstration unit of their finishing machinery for fur-like high pile fabrics. The equipment is being shown to mill owners by appointment.

The Turbo machines give knitted or woven fabrics, principally of Orlon and Dynel, the appearance of natural fur. The demonstration unit includes the Electro-Finisher and the Shearer. A Wet Applicator is under construction. Its performance is now being simulated with a spray.

Sample lots are now being processed in the individual machines. In actual mill operation, the equipment can be set up as a finishing range, a Turbo spokesman said.



Pigment colors being cured on fabrics



Hermas Selvage Trimmer with photo-electric sensing heads

New Textile Printing Development

A new development in the field of textile printing, namely, the curing of pigment colors in straight-pass, high-speed operations, usually on regular plant equipment, is attracting considerable interest.

As one example, the illustration above shows pigment colors being cured on fabrics running 2.5 yards per pound, at speeds of 30-35 yards per minute through only 12 feet of heat. Higher speeds are optional.

The installation pictured is at Pioneer Textile Printing Co. Inc, Brooklyn, NY, commission roller printers of silks, synthetics and mixtures. When ordinary printing inks are used, the Electro-Ceramic curing units made by Radiant Heat Enterprises, Inc, Short Hills, NJ, are used to remove ink odors from the fabrics.

This method reportedly delivers a positive cure that meets all standard wash tests. Tests also indicate greater uniformity of cure than conventional curing methods, it is claimed.

Pioneer ordinarily frames its printed fabrics, so the tenterette logically holds the curing device. It is said to be low in cost and, by making use of present equipment, it uses no additional floor space.

In addition to their use with tenters, the Electro-Ceramic curing installations are being used directly on printing machines, or in conjunction with agers, or the goods are cured in fast beam to beam operations. Pioneer reportedly finds it fast, clean and exact.

The economy of straight-pass curing is said to be proving of decided interest both North and South. It is claimed that the low equipment cost is promoting greater interest in the use of pigment colors, while it permits smaller plants to cure padded or printed colors because a major investment is unnecessary.

Elosol

New antistatic agents called Elosol have been announced by Sandoz Chemical Works, Inc. Three types are available, Elosol SG, Elosol V, and Elosol UW. Each is suitable for application to synthetic fibers in loose yarn, and piece goods form. Application of the product is simple, and may be carried out during any stage of processing.

Elosol SG is a water-soluble, neutral, nonionic, cream-colored paste which repeatedly imparts a soft hand and a slight scroop to the fiber. The antistatic effect is said to withstand rinsing with boiling water but is not fast to washing. An anhydrous brand, Elosol SG Conc, can be added to mineral or vegetable oil lubricants or softeners for spinning, combing, or sizing.

Elosol V is a neutral, nonionic, clear viscous liquid of brown color, which is said to be easily soluble in water. It reportedly has no noticeable effect on the hand of the goods. The antistatic effect obtained with Elosol V is said to be fast to rinsing with boiling water, but it is not fast to washing. Elosol V is suitable for addition to oil-in-water emulsions.

Elosol UW is a neutral, brownish paste of cathionic character. It also acts as a softening agent. The effect reportedly obtained with Elosol UW is fast to hot and cold rinsing and also fast to washing—as long as soap or synthetic detergents are used at temperatures not exceeding 105°F. It is not fast to washing with soda ash.

Graphs illustrating the relative effects of the three Elosol products are published in Sandoz booklet C-620, entitled "Elosol anti-static agent." Copies are available from any Sandoz District Sales Office.

Selvage Trimmer Features Improved Sensing Unit

Many mills weaving fabrics with wire loop selvages or fabrics developing slack selvages during weaving have been reluctant in the past to use an automatic selvage trimmer to remove hanging selvage threads, for the pendulum-type selvage sensing devices with which selvage trimmers were equipped did not always function properly on this type of cloth.

Field tests by engineers of the Hermas Machine Company, Hawthorne, N J, proved the pendulum-type selvage sensing devices sometimes permitted the trimmer units to move in too close; resulting in cut wire loops or nicked selvages.

After considerable experimentation with various types of edge-sensing devices, Hermas adopted a unique, split-beam, photo-electric eye equipped with 2-way controls instantly adjustable for varying cloth trimming conditions.

It is claimed that, since this new photo-electric eye sensing unit actuates the traverse of the trimming units without touching the cloth, fine control to within 3/32″ is achieved. With this setting wire-loop, it is stated, selvages can be trimmed without cutting the loops and slack selvages trimmed without nicking the selvage.

Literature on the improved selvage trimmer is available from Hermas Machine Co.

Polyethylene Buchner Funnel

Newest addition to Ace Glass Inc's line of polyethylene ware is a sturdy 2-piece construction Buchner Funnel, which may be easily cleaned. It takes 70-mm filter paper. Perforated plate diameter, 71mm.

Literature is available from Ace Glass Inc, Vineland, NJ.

Bradtone PE

A new finishing agent for worsted and woolen fabrics has been developed by the Original Bradford Soap Works, Inc, West Warwick, RI. It has been designed so that it can be easily applied to the final wet operation of the finishing department.

The finish, known as Bradtone PE, is nonionic in nature, permitting its easy use in the finishing operation wthout concern for the compatibility with other finishing ingredients. It is said to be equally effective on wools and worsteds and/or blends of wools and worsteds with synthetic fibers and reportedly may be used without concern for any change in the dye shades.

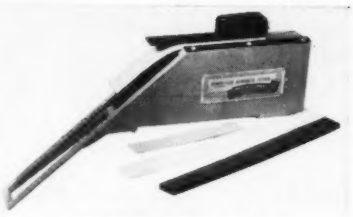
Because of the lubrication imparted to the fibers, it is claimed that colors are brighter and clearer. Bradtone PE is said to be an excellent aid in the mechanical finishing of cloth, such as napping, etc. OBSW states that it will replace the natural lubricants that are removed when the cloth is subjected to drycleaning or shrinkproofing operations, thus restoring a good handle and feel to the fiber. Bradtone PE will also impart a better wool-like hand to blended fabrics, it is claimed.

Bradtone PE is said to be readily dispersable in cold water, making for ease of formula preparation and application. Crease recovery, resistance to needle cutting, sewability and tensile strength are all reported to be greatly enhanced by the addition of 1 to 3% of Bradtone PE. The finish that Bradtone PE imparts is said to be resistant to washing, drycleaning and yellowing on aging.

N-Acetyl DL-Homocysteine Thiolactone

Schwarz Laboratories, Inc, 230 Washington Street, Mount Vernon, N Y, has announced the availability of N-Acetyl DL-Homocysteine Thiolactone, a compound with remarkable properties that may find application for the shrinkproofing of wool.

The material may provide at least two possibilities for shrinkproofing by: 1) modifying the elastic property of wool by forming new peptides and 2) providing greater rigidity by producing new cross linkages in the form of disulfide bonds after reduction of the wool. This property of N-Acetyl DL-Homocysteine Thiolactone reportedly has already been demonstrated with free amino acids and peptides at low temperature under mildly alkaline conditions where the product produces cross-linking through a free sulfhydryl group formed by reaction with an amino group.



Model-X Drape-Flex Stiffness Tester

Model-X Drape-Flex Stiffness Tester

Fabric Development Tests, Inc, has announced its Model-X Drape-Flex Stiffness Tester for use in measuring the stiffness of extra thick sheet materials, such as felt, carpets, battings, sponge rubber and plastic foam.

The new Model-X tester reportedly can be used with materials in any thickness from ⅛" to 2" or more and in strip lengths up to 14". Other improvements include the relocation of reference angle slope supports and leveling screw so that these will not interfere with the measurement of stiff, thick materials requiring the use of the slope extension.

The standard Drape-Flex Stiffness Tester, which conforms to Federal Test Method 5206 and ASTM Method 1388-55T for measuring the stiffness of fabrics, is limited to use with thin materials up to about ¼" thick.

Further information may be obtained from Fabric Development Tests, Inc, PO Box 45, Brooklyn 32, NY.

Ampitol PE-30

A permanent, nonyellowing softener and lubricant for use in resin formulations on wash-and-wear cottons has been announced by Dexter Chemical Corp, New York, NY.

The product, Ampitol PE-30, is a nonionic emulsion of polyethylene, which, according to the company, increases considerably the tear and abrasion strength of wash-and-wear fabrics as well as imparting an excellent hand. Due to the lubricating properties of the new product, it is claimed, cutting and sewing of resin-treated cottone are improved immeasurably.

Because of its nonionic nature, Ampitol PE-30 is said to be compatible in formulation of urea-formaldehyde, melamine-formaldehyde or cyclic ureas, the main types of thermosetting resins applied to wash-and-wear cotton fabrics.

For some time, low-molecular-weight polyethylene resins have been known as excellent permanent softeners and lubricants in the wash-and-wear field. The company points out, however, that previous methods of emulsifying these resins caused yellowing on storage of the goods or reacted with the thermosetting resins to produce yellowing. It is claimed that, with the development of new emulsifying methods for Dexter's nonionic product, this problem has been overcome. The softener can be used on the acid or alkaline side, and, it is said, will withstand magnesium salts of various types.

Synthrapol PWS

Synthrapol PWS, a nonionic surface active agent, has been announced by Arnold, Hoffman & Company, Inc, as culminating three years' research in the field of ethylene oxide condensates.

Exceedingly favorable results are reported for initial investigations of use of Synthrapol PWS in the textile and paper industries.

It is stated that, on the basis of redeposition and soil-removal tests, Synthrapol PWS is shown to possess excellent detergent properties on cotton, even in extremely low concentrations. Similarly, low concentrations reportedly produce extremely effective results when Synthrapol PWS is used as a woolen piece goods detergent and as a scouring agent for raw wool. For cotton- and wool-scouring procedures, Arnold, Hoffman suggests initial concentratons of 5 oz per 100 gal. Aside from this agent's normally high detergency in low concentrations, it is reported that detergent properties can be increased considerably by the addition of any one of a number of builders.

Synthrapol PWS is described in Ahco's Technical Bulletin No. 132 as showing good compatibility with other agents. Being chemically inert, it reportedly possesses much greater stability under a variety of conditions than do the anionic surface-active group. It's said to be fully effective in hard water and, unlike soap, will not form precipitates with calcium and magnesium salts.

In specific applications in the textile field, Synthrapol PWS is recommended by AHCO for soaping off and cleaning up stained prints. In starch desizing operations, it reportedly will not adversely affect or be affected by the action of enzymes. And in wool scouring procedures, by eliminating alkali, Synthrapol PWS is said to offer numerous advantages: production costs are lower, there is no danger of alkali damage, better color and handle of the fiber are assured, and in the absence of alkali it is possible to scour at much higher temperatures.

New Ciba Colors

Ciba Co, Inc, 627 Greenwich St, New York, NY, has announced the addition of six new colors to its line of dyestuffs—three in the Deorlene series, two in the Cibalan series, and one in the Cibanone group.

Ciba's Deorlene series has been expanded to include Deorlene Brilliant Yellow 5GL, a bright greenish yellow; Deorlene Brilliant Red R, a bright, rich red; and Deorlene Blue BR, a pleasant, slightly reddish blue.

The very attractive colors of the new Deorlenes reportedly lead to dyeings of considerable brightness, either as self shades or in fashion shade formulas. Fastness properties are said to be paced by the 100 hours light fastness and very good wash fastness shown by Deorlene Brilliant Yellow 5GL. Money value of the three dyes makes them quite economical for most shades, while Deorlene Blue BR offers particularly good build-up in darker shades, it is claimed.

It is stated that the new Deorlenes are peculiarly suited to dyeing the clean, lively shades generally in demand for Orlon and Acrilan. Teamed with the older Deorlenes, they are said to add fresh significance to this growing group. For pastel shades or warm, rich colors on sweaters, blankets, suitings and other knitted or woven fabrics, the three new Deorlenes dyes are highly recommended by the manufacturer.

The addition of two new dyes to the Cibalan series calls attention to the wider color range of this prominent group of fast dyes for wool, nylon and silk. The introduction to the market of a brilliant red and a slightly reddish blue in this series brings to 29 the total of Cibalan dyes.

Cibalan Brilliant Red BL yields attractive shades from pastel pink to bright crimson. Its color places it in the "brilliant" group with two other Cibalans, Brilliant Yellow 3GL and Brilliant Blue GL. It is claimed that, because of its color and unusual fastness in its shade range (80-100 hours in sunlight), Cibalan Brilliant Red BL stands out in any group of red dyes for wool and nylon. It is also well suited for shading dyeing formulas of other Cibalan colors.

Cibalan Blue FBL produces a pleasant, slightly reddish shade of blue, ranging to royal blue in heavier shades. Reportedly possessing all-round good fastness, it is applicable at all stages of yarn and fabric processing. Well suited for combinations with other Cibalans, it is especially recommended by Ciba as a base for navies and for toning clean violet shades. Dyeing procedures for the Cibalans are said to be simple. The goods are run either in neutral or acid baths (with the assistance of Cibalan Salt S). No aftertreatments are required.

Cibanone Yellow LGR Paste, a new Ciba specialty, reportedly yields vat dyeings of a golden yellow shade with good all-round fastness and remarkably good light fastness in particular. Microfined physical properties of this new dye are said to promote level dyeing, uniform shade control and best results in pigment application.

It is stated that the striking, clean color of Cibanone Yellow LGR Paste provides a good base for vat yellow formulas. Fastness to light is said to be excellent, rated at 200-240 Fade-Ometer hours. Wash fastness is rated 5 in AATCC #4 test. Stability in reduction contributes to trouble-free leuco application in the open bath or on the padder, it is claimed, and the dye's property of exhausting on tone in continuous dyeing provides good shade control in long runs.

The manufacturer states that traditional problems of fast yellow shades on cotton and rayon, especially light fastness of pastel yellows, are largely overcome by Cibanone Yellow LGR Paste. Piece goods and knitted fabrics in up-to-date fashions are said to include a number of bright golden shades that are economically dyed with this new vat color with its better fastness.

No. 11061-R Temperature Regulator

Designed to withstand the corrosive effects of certain fumes, gases, acids and chemicals, a new stainless-steel temperature regulator is now offered by Fulton Sylphon Division of Robertshaw-Fulton Controls Company, Knoxville, Tenn.

According to Fulton Sylphon, the new regulator, called the No. 11061-R, was developed mainly for use in chemical plants. Other applications seen for the regulator are in plating rooms and in processes where ammonia vapors are present. It is also recommended for exposed locations.

In standard models of this control, the entire upperworks are of stainless steel. The company said it will supply valves, as well as upperworks in stainless steel, for use in extremely corrosive situations. The No. 11061-R is available in sizes from ¼" to 4", and in temperature ranges between 20°F and 455°F.

Similar in operation to other Fulton Sylphon regulators, the new No. 11601-R requires no external power source, such as compressed air, water or electricity to function efficiently. A large stainless steel bellows used in the thermal unit reportedly provides accurate and sensitive control over temperature.

Depco Bleach Assist XD

De Paul Chemical Company, Long Island City 1, N Y, recently announced the development of a new, much improved stabilizer for sodium chlorite bleaching of synthetic fibers.

Depco Bleach Assist XP in paste form, or Depco Bleach Assist XD, in dry, powder form reportedly performs not only in control of out gassing of toxic chlorine and of corrosion prevention, but imparts greatly improved whiteness to all synthetic fibers in the same bleach bath at no extra cost and with no additional processing. It is claimed that a comparison of white goods treated with new Depco Bleach Assist XP or Depco Bleach Assist XD with goods treated in the ordinary manner shows great improvement.

Lauramine RT

Laurel Soap Manufacturing Co, Inc, Philadelphia 34, Pa, has announced the availability of Lauramine RT, its new anionic softener.

Recommended by Laurel Soap for the finishing of cotton fabrics and yarns, Lauramine RT may also be used on rayon, wool and certain synthetics and blends with excellent results, it is claimed.

It is a soft, fluid paste which is said to be readily dispersible in warm or tepid water, extremely resistant to high temperature and aging effects, and will not change the shade of dyed fabrics or yellow whites. Lauramine RT reportedly will impart to a fabric a uniform, full-bodied softness and provide excellent lubrication, which will improve the sewing and cutting properties. This Laurel product is said to give fine results when used as a top softener on resin-treated goods and to be an excellent softener for use on goods to be napped, imparting just the right degree of softness and lubrication to the fabric and holding up the nap once it is raised.

Lauramine RT is claimed to be an ideal softener for print cloths because it resists penetration of the print paste and thereby promotes a higher color value. This property is particularly desirable in pigment printing. It is also useful as a replacement for conventional oils and softeners, either wholly or in part, in the Sanforizing process. Applied to denims and chambrays, for example, it will lubricate the fabric as it passes over the shoes, will produce a fabric which is not as limp and raggy as conventional oils, and will also improve the cutting and sewing properties, it is stated.

Samples of Lauramine RT may be obtained from the manufacturer.

• NAMES IN THE NEWS •

Rothemich

Davies

Spitzer

Lane

Croasdale

Williams

William J Rothemich has been elected a vice president of Interchemical Corp. Mr Rothemich has been divisional president of both the R-B-H Dispersions Division and, most recently, the Textile Colors Division. He joined Interchemical in 1933.

William N Davies, previously a vice president and Eastern district manager of Interchemical's Printing Ink Division, succeeds Mr Rothemich as head of the Textile Colors Division. He has been with Interchemical since 1927.

Francis A E Spitzer, formerly Interchemical secretary and head of its legal staff, has been named vice president of its International Division. **Kenneth B Lane,** a member of the legal staff since 1945, will succeed him.

William Croasdale has joined the Textile Colors Division as head of the Dyestuff Sales - Service Laboratory with headquarters at Hawthorne, N J. Mr Croasdale, a veteran of thirty years in the dyeing and finishing industry, was most recently divisional superintendent at Duro Finishing Corp.

Bryant Chemical Corporation has announced the addition to its technical staff of **Richard Roberts,** formerly with the research department of the Tecnifax Corp, Holyoke, Mass.

Mr Roberts will be located at the Bryant Chemical research and development laboratory at Hingham, Mass.

William H Weed has been appointed manager, Engineering Department of Mutual Chemical Division, Allied Chemical & Dye Corporation. Mr Weed, previously chief process engineer, will be responsible for all activities of the Engineering Department, which is located at Mutual's Baltimore works.

Robert G Surette, has been awarded a $2000 Albany Felt Company scholarship at Lowell Technological Institute, where he is enrolled in the textile engineering course as a freshman.

The award, given by the Albany Felt Company, Albany, NY, will be made in the amount of $500 for each of his four years at LTI.

George R Williams has been appointed sales representative in the New York City area, representing the Organic Chemical Sales Department of Emery Industries, Inc, Cincinnati, Ohio.

Under the direction of **J W Ritz,** eastern district manager, Williams will handle Emery's line of organic chemicals. Prior to joining Emery, he was the Cincinnati area salesman for Merck & Company, Inc.

Charles W Dorn has been named director of Dexter Chemical Corp's textile testing laboratories.

Mr Dorn retired last year as director of research of the J C Penney Co after 26 years in that capacity. He is chairman of the Executive Committee on Research of the American Association of Textile Chemists and Colorists and is recognized as one of the leaders in the field of textile standards and testing procedures.

He will continue as consultant to Sanitized, Inc, in addition to his work at Dexter.

TECHNICAL LITERATURE

(It is understood that the following literature is available from the sources listed in italics.)

ACETO PRODUCTS BULLETIN—*Aceto Chemical Co, Inc, 40-40 Lawrence St, Flushing 54, NY*—Over 200 fine chemicals, intermediates, and industrial chemicals are listed in this new 4-page bulletin. Chemicals for the dyestuff, textile, plastic, paint, electroplating, metals, rubber, drug, paper, chemical and agricultural industries are included. The products are listed both by industry and by chemical group to facilitate easy reading.

ALCO PRODUCTS AND THEIR APPLICATIONS—*Alco Oil & Chemical Corp, Trenton Ave and Williams St, Philadelphia, Pa*—Among the products are wetting agents, latex compounds for upholstery and carpets, ultra-accelerators rubber compounding materials, latex compounds for foam rubber production, stabilizers, and thickeners.

ARQUADS—*Armour & Co. Chemical Div, 1355 W 31st St, Chicago 9, Ill*—The chemical and physical characteristics of Armour's quaternary ammonium salts, the Arquads, along with their applications and formulations are outlined in this new booklet.

Described as wetting, sanitizing and emulsifying agents, these cationic surface-active agents may be water-soluble, oil-soluble or water-dispersible, depending on their composition.

Their chief textile applications are as antistatic agents and softeners.

BULK STORAGE OF POLYVINYL ACETATE EMULSIONS—*Colton Chemical Co, 1747 Chester Ave, Cleveland 14, O*—PVB No. 522 describes methods of shipment, storage tanks, piping and valves, pumps and installation costs. A schematic view of a bulk storage plant is included.—*4 pages.*

CARE AND FEEDING OF RUBBER ROLLS—*Rodney Hunt Machine Co, Orange, Mass*—The maintenance of rub-

ber rolls, of prime importance to many industries, is the subject of Roll Report No. 11.

A handy table lists faults and the causes of faults commonly found in rubber rolls, together with recommended treatments. Also presented is a thorough discussion of maintenance techniques, with recommendations about problems involving grooves, cracks and surface damage, lubrication, cleaning, transportation and storage.

Emphasized is the necessity for a regular inspection program when rolls are put in service. Roll Report No. 11 will help roll users to get maximum efficiency and quality of production through systematic roll maintenance.

CHLORINE EVAPORATOR (Catalog 70-21)—*Fischer & Porter Co, 889 Jacksonville Rd, Hatboro, Pa*—This new unit has a maximum capacity of 6,000 pounds of chlorine per day.

COLUMBIA* ACTIVATED CARBON—*National Carbon Co, 1300 Lakeside Ave, Cleveland 14, O*—This 8-page illustrated booklet opens with a discussion of adsorption as a unit operation in chemical processing, explaining the properties of activated carbon that make it such an excellent adsorbent.

Separate sections discuss various other chemical and industrial processes.

The various mesh sizes available for different applications are mentioned, as well as activated carbon coatings and special preformed shapes.

*Reg trade-mark

CYANOETHYLATION OF COTTON FABRIC—*Southern Utilization Research Branch, 1100 Robert E Lee Blvd, New Orleans 19, La*—A report of processing conditions found necessary to assure uniform cyanoethylation of cotton yarns and fabrics. The investigation was prompted by increasing interest in the use of cyanoethylation to improve mechanical and dyeing characteristics of such yarns and fabrics and increase their resistance to rotting.

Results indicate that local overheating during the reaction is one of the principal causes of uneven treatment. It was also found that moisture content of the reagent is an important factor, and that for best results the reagent should be evenly applied to the material being treated.

The research workers developed pilot plant apparatus especially adapted to provide the required conditions, and permit treatment of 50-yard rolls of 80-square cotton fabric. Thermocouples placed within the roll were used to direct temperature control and valves permitted alternate reversal of the reagent flow to maintain a more uniform temperature. It was found that by careful control of these various factors, the degree of cyanoethylation could be held within a very narrow range of nitrogen content in the finished product, and treatment be kept uniform.

A schematic diagram of the pilot plant, details of the process, and results of the experiments are given.

DIMETHYLAMINOETHYL METHACRYLATE—*Rohm & Haas Co, Washington Sq, Philadelphia 5, Pa*—Technical notes on dimethylaminoethyl methacrylate, now being supplied in pilot plant quantities by Rohm & Haas Company, are available on request. In addition to listing physical properties, toxicity, presence of an inhibitor, polymerization and quaternization of the monomer, the notes also describe copolymerization of dimethylaminoethyl methacrylate with methacrylate acid, methacrylate esters, acrylonitrile and other monomers.

DIMETHYLHYDANTOIN BIBLIOGRAPHY—*Glyco Products Co, Inc, Empire State Bldg, New York 1, NY*—Gives references on physical properties and chemical reactions for this new commercial product.

These references cover reactions with mineral acids, alkalis, acetic anhydride, methylating agents, chlorine, formaldehyde and noble metal salts. Some of the reaction products shown are alpha-amino isobutyric acid, 1-nitro-5,5-dimethylhydantoin, 1-acetyl-dimethylhydantoin, alpha-ureido isobutyric acid, 3,5,5-trimethylhydantoin, chlorodimethylhydantoin, silver and gold dimethylhydantoin salts, methylol-dimethylhydantoin, methylene-bis-(dimethylhydantoin).

DYEING, PRINTING, FINISHING AND HEAT TREATING FABRICS OF ARNEL AND ARNEL BLENDS—*Textile Div, Celanese Corp of America, P O Box 1414, Charlotte, NC*—Latest commercial formulas are given in bulletin TD-15A.

Formulas for efficient conversion to commercial operations, described in the 56-page bulletin, provide a greatly expanded number of selected dyes that are said to give unusually good results in washfastness, sunfastness, gas fading, and sublimation on heat treatment. The number of disperse dyes found satisfactory is increased to 47, providing 19 additional formulas.

The sections on azoic dyeing and on printing are greatly expanded and brought up to date. In addition, data on 34 selected fixable direct dyes for use on cotton in Arnel-cotton blends have been included. The number of colors in the tables listing color range and performance is increased by 10, bringing the total to 29. Also, a new section on Arnel-acrylic blends has been added to the bulletin.

EMULSIFIABLE A-C POLYETHYLENE—*Semet-Solvay Petrochemical Division, Allied Chemical & Dye Corp, 40 Rector St, New York 6, NY*—This new 24-page edition contains data on many types of emulsions and emulsifiers. While the information will be of particular interest to the polish industry, the basic data will also find application in the textile and paper industries.

GUIDE FOR SELECTING VALVES, BOILER MOUNTINGS, LUBRICATING DEVICES—*The Lunkenheimer Co, Cincinnati 14, O*—Circular No. 555 is a newly revised edition. New sections, describing new LQ600 Bronze Globe Valves, with Brinalloy Seats and Discs; Luncor PVC All-Molded Valves, which are said to be completely resistant to industrial chemicals; and Lunkenheimer Solder End Valves have been added to the 24 pages of tables, technical data and information.

HIGH POWER ULTRASONIC GENERATORS FOR MASS PRODUCTION—*Acoustica Associates, Inc, Glenwood Landing, NY*—Bulletin DR-2000 describes high power ultrasonic generators and transducers adaptable to practically any type of tank configuration and dimension. It provides details of how two Acoustica generators, Model DR-2000AL (low frequency) and Model DR-2000AH (high frequency), can be applied for powering large-scale, high-volume batch or automated ultrasonic cleaning, machining and liquid processing systems.

Several typical tank arrays are illustrated to show the "Building-Block" flexibility of the Acoustica ultrasonic systems. Specifications are also given for Acoustica Model AM-203B (magnetostriction) and Model AC-40 (barium titanate) transducers.

Applications include irradiation of textile wet processing baths; the rapid emulsifying of many *immiscible* liquids; mixing and dispersing of solids and liquids.

INDANTHRENE GREY GG INFRA DOUBLE PASTE—*General Dyestuff Co, 435 Hudson St, New York 14, NY*—Bulletin G-794 describes this new straight anthraquinone-type vat dyestuff manufactured for dyeing greenish-blue greys of generally excellent fastness properties on cellulosic fibers, including especially excellent fastness to light, chlorine, and caustic alkali. The new grey is finished by the Infra process, which is said to yield a paste that is remarkably uniform in excellence of dispersion quality and particularly suitable for pigment padding and for circulation before reduction.

G-794 discusses shade and fastness, working properties, uses, application (reduction, dyeing, and soaping dyeings). Properties and fastness ratings of full shades on cotton and rayon are listed. Bulletin includes 12 samples dyeings, three on cotton yarn, three on rayon yarn, three on cotton sheeting, and three on spun rayon.

IS THIS THE WORLD'S TOUGHEST TEST FOR BRUSHES?—*M W Jenkins' Sons, Inc, Cedar Grove, NJ*—The problems of early methods of textile printing are discussed, as well as the rapid and revolutionary changes in the industry after World War II.

The 4-page brochure features the new flexible, high-speed textile printing process, Darex Versaprint, developed by Dewey and Almy Chemical Co, Div of W R Grace and Co. Graphic diagrams reveal details of the process and mechanical phases of the operation. The application of Jenkins' Metlkor brushes in the Darex washers and dryer units is illustrated photographically.

JAGUAR(R) GUAR GUM BY STEIN HALL—*Jaguar Dept, Stein, Hall & Co, Inc, 285 Madison Ave, New York 17, NY*—This 16-page brochure describes in detail the unusual combination of physical and chemical properties possessed by this new, versatile, pure vegetable colloid. The booklet also includes information on food and drug standards concerning guar gum, methods of handling the product, types available, applications, etc.

LABORATORY REFERENCE CHART—*Arnold, Hoffman & Co, Inc, Providence, RI*—In compact 8½ x 11-inch size, this new chart is imprinted on rugged card stock for durability and punched for ready filing in a three-ring binder or convenient hanging on the laboratory wall.

The chart provides such data as comparative hydrometer scales, comparative Centrigrade and Fahrenheit temperature tables, atomic weights of the chief elements, metric equivalents, formulas for determining capacity of cylindrical and rectangular vessels, tables of decimal equivalents in fractions, and conversion tables for gallons to liters as well as for grams per liter to ounces per gallon and vice versa.

Also provided are data on preparation of test papers and on methods of determining available chlorine in bleaching powder and in sodium hypochlorite. A table defines the essential nature of each of a list of synthetic fibers now in general use, and another table lists the purpose or nature of a number of Ahco products.

LIMITATIONS OF THE INDIRECT UNTWIST-TWIST AND DIRECT-COUNTING METHODS FOR DETERMINING TWIST IN CARDED COTTON SINGLE YARNS—*Southern Utilization Research Branch, 1100 Robert E Lee Blvd, New Orleans 19, La*—The untwist-twist method for determining the twist in carded cotton single yarns is not sufficiently accurate and reliable for use as an acceptance test or standard procedure, is the conclusion of Ruby K Worner after completion of a series of studies on the subject. The investigations were made at the Southern Utilization Research Branch of the Agricultural Research Service, USDA.

The tests showed that results by the untwist-twist method varied appreciably from the actual count and "machine" twist, not only in the whole sample, but from inch to inch of the sample. At least two factors, opposite in effect and varying with different yarns, appeared to be operating simultaneously during the untwist-twist test, namely, a) torsional effects due to mechanical strains, which influence the stress-strain relationship and lead to underestimates, and b) the slippage of fibers which results in overestimates. Some differences appear to result from thick and thin places in the yarns. Tension was also found to be an important factor, and one which could not be easily and reliably corrected.

The untwist-twist method may be useful in cases where estimates are satisfactory, but Dr Worner recommends an actual count where strict accuracy is required, and suggests that the real need is for more rapid direct-counting instrumental aids which operate as automatically as possible.

Methods of the tests and the results are reported.

LINE-OPERATED pH METER MODEL 85—*Photovolt Corp, 95 Madison Ave, New York 16, NY*—Circular #195 gives pertinent information on Photovolt's line-operated pH meter, which is offered in a price class of less than $100.00.

Model 85 is said to have an accuracy of 0.1 pH unit. It can be furnished either with individual glass and calomel electrodes or with a "probe" electrode, ie, a combination of glass and calomel electrodes.

#195 also lists prices of the meters and accessories.

1957 LISTING — PRODUCTS OF UNION CARBIDE AND CARBON CORPORATION—*Union Carbide and Carbon Corp, 30 East 42nd St, New York 17, NY*—This 12-page booklet includes the following information: trade marks of UCC and subsidiaries; sales offices of UCC divisions and subsidiaries; and an alphabetical list of products with company designation.

MCA SAFETY DATA SHEETS—*Manufacturing Chemists' Association, Inc, 1625 Eye St, Washington 6, DC*—MCA has announced a new safety data sheet on mixed acids (SD-65), available at 30¢ a copy.

The booklet, part of a continuing series of safety data sheets, gives properties and essential information for the safe handling and storage of mixed acids, including material on properties, shipping containers, storage, waste disposal, medical management and employee safety.

The publication of revised safety data sheets on trichloroethylene (SD-14), ethyl ether (SD-29), and phthalic anhydride (commercial) (SD-61) also has been announced by MCA.

NEW, DUSTLESS VATROLITE—*Royce Chemical Co, Carlton Hill, NJ*—Vatrolite, a specially concentrated, granular form of sodium hydrosulfite, is a powerful agent with applications in the textile industry for vat dyeing and color stripping.

The new data sheet describes the application of Vatrolite in pad-steam dyeing, indigo dyeing, reduced vat dyeing, stripping direct colors and in vat-color stripping. Times, temperatures and stock preparations are given.

The data sheet also cites the properties and advantages of improved Vatrolite for textile industry use.

ORZAN A, ORZON S, SOLUTIONS AL-50 AND SL-50—*Crown Zellerbach Corp, Chemical Products Div, Camas 4, Wash*—This 24-page technical brochure gives specifications and general physical and chemical data. The Orzans are a group of surface-active, lignin sulfonate chemicals for industry. They are derived from the chemically significant noncellulose portion of the tree, the spent liquor resulting from the manufacture of paper by the sulfite process. Among the major applications: dispersants for dyestuffs and wetting agents and dispersants for carbon black.

OXIDATION OF DYES ON COTTONS AND SYNTHETICS WITH PEROXYGEN CHEMICALS—*Becco Chemical Div, Food Machinery and Chemical Corp, Station B, Buffalo 7, NY*—Latest information on oxidation of vat and sulfur dyes on cotton and synthetics is covered in Bulletin No. 75.

Typical procedures for oxidation of vat dyes with hydrogen peroxide or sodium perborate, and sulfur dyes with ammonium persulfate are presented in the 13-page booklet. Bath concentrations, make-up for mix tank, feed rates, bath temperatures, pH adjustments for continuous and jig dyeing of piece goods, and package dyeing of yarn and raw stock are discussed in detail.

A continuous dyeing procedure, which combines an oxidizing and soaping operation in a single tank and thereby makes available an extra compartment for rinsing, is outlined. The new bulletin also offers a section describing the advantages of ammonium persulfate for producing brighter shades, improving hand and knitting characteristics, and allowing easy corrections of off-shades and a wide latitude of bath concentration without affecting the most sensitive of sulfur dyes.

PACKLESS VALVES, CATALOG "F"—*E D Rogers, Fulton Sylphon Div, Robertshaw-Fulton Controls Co, Box 400, Knoxville 1, Tenn*—A complete line of packless valves for applications involving hazardous liquids and gases, as well as uses in nuclear energy installations, is described in this 22-page bulletin.

Each valve covered in detail in the catalog contains a metal bellows as the packless feature. Metallic bellows, the company points out, eliminate the need for conventional packing materials and also insure leakproof construction.

It is stated that packless valves produced by Fulton Sylphon have been widely used in the manufacture of chemicals, dyestuffs, textiles, etc.

More than 20 cutaway views of different packless valve models are included in the three-color booklet. Detailed data on specifying and ordering, and charts concerning the application and selection of packless valves, also are included. One chart lists the resistance of various metals used in packless valves to the corrosive action of more than 200 different chemicals and gases.

PARTIALLY ACETYLATED COTTON FIBER AND TREATMENTS TO FACILITATE PROCESSING INTO YARN—*Southern Utilization Research Branch, 1100 Robert E Lee Blvd, New Orleans 19, La*—Recent investigations indicate that it may be feasible to use treated stock for the manufacture of partially-acetylated (PA cotton) prod-

ucts. At present the PA treatment is applied only to the yarn or fabric because of difficulties in the processing of treated stock, and such treatment of some heavier fabrics has not been practical. The need for a readily spinnable PA cotton fiber led to investigation of this problem at the Southern Utilization Research Branch of the Agricultural Research Service, USDA, and studies have resulted in several promising developments.

One of the difficulties in the mechanical processing of PA cotton fiber has been the generation of static electricity which interferes with operations such as carding and roller-drafting. Of several possible remedies, greatest attention was given to use of antistatic agents and the blending of PA with untreated cotton. Blends of PA cotton stock with 10% and 20% untreated cotton were processed. Strength retention after heating for both lots compared favorably with the PA cotton control. Blending with 20% untreated cotton almost completely eliminated static, so that mechanical processing was satisfactory in the five-pound lots processed, but the 10% blend produced more static than is desirable.

A number of commercial antistatic agents and processing aids were evaluated, but only two were promising, in that the heat endurance of the yarn was not lowered. Lots treated with these products had better fiber separation and fewer neps in the card webs than lots treated with other finishes.

Details of the investigations, and additional information on the changes in the properties of cotton fibers upon partial acetylation are reported.

RAPIDOGEN BLACK 1 — *General Dyestuff Co, 435 Hudson St, New York 14, NY*—Circular G-796 covers in detail this economical stabilized azoic-type black in powder form, which is said to have exceptional tinctorial strength. This product, in spite of its relatively low price, is said to give prints that are adequate in light fastness for cotton and rayon dress goods and in wet fastness for materials that must withstand severe washing.

G796 discusses shade, fastness, end uses, and working properties; gives a recipe for acid aging; lists fastness ratings of 4% prints on cotton or rayon; and includes a sample dyeing of a 4% cotton print.

1957 REFERENCE GUIDE TO DOW CORNING SILICONES—*Dow Corning Corp, Midland, Mich*—Almost 150 commercially available silicone products are described in this year's catalog, including several which were developed within this last year.

As in previous annual issues, products are grouped by usage (water-repellents, dielectrics, release agents, etc).

Descriptions are brief and factual, with emphasis on charts, tables and graphs directly comparing various silicones with the materials they are displacing. Heavily illustrated with application photographs. Twelve pages, two colors.

ROTATING VACUUM TRANSMITTER FOR AUTOMATIC CHLORINE PROPORTIONING ***(Catalog 70-27)*** —*Fischer & Porter Co, 906 Jacksonville Rd, Hatboro, Pa*—The rotating vacuum transmitter is used with a rotating type flowmeter and a chlorinator. The transmitted signal regulates chlorine feed in direct proportion to the main line flow.

SHOWERPROOFING, ROTPROOFING, MOTHPROOFING — *Catomance Limited, 94 Bridge Rd, East Welwyn Garden City, Herts, England*—Catomance Limited which exports to the US, has compiled in booklet form, twenty-five technical leaflets covering the use of its products for showerproofing, rotproofing and mothproofing.

It is felt that the information on lauryl pentachlorphenol is of special interest, in that it is specified by many government departments the world over, for the rotproofing of textiles.

SOLVAY PRODUCTS—*Dept PB, The Solvay Process Div, Allied Chemical & Dye Corp, 61 Broadway, New York 6, NY*—A comprehensive new book containing detailed information on the entire line of Solvay alkalis and chemicals.

This "Products Book", as it is called, includes informative data on the uses, markets, physical and chemical properties, packaging and handling and storage of the Solvay line. Also included is a listing which groups the products by consuming industries or manufacturing processes. The book is illustrated with photos of buildings and manufacturing operations at the various Solvay plants.

TECHNICAL SEMINAR ON SYNTHETIC LATEX POLYMERS—*Chemical Div, The Goodyear Tire & Rubber Co, Inc, Akron 16, O*—This 44-page booklet includes topics covered by Goodyear personnel at technical seminars conducted last year at Camas, Wash, and Atlanta, Ga.

The following papers are included: "The Synthetic Latex Industry" by H R Thies; "Theoretical Consideration of Polymerization and Latex Characteristics", by J D D'Ianni; "The Course of a Product Development", by J D D'Ianni; "Properties of Latex Systems and Evaluation Procedures" by W C Smith; "The Influence of Latex Variants on Important Performance Characteristics" by W C Smith; "Sources of Materials for Latex Manufacture" by R S Earhart and A E Polson; "The Production of Synthetic Latex", by R S Earhart and A E Polson; "Types of Latex Commercially Available" by R S Earhart and A E Polson; and "A Survey of Latex Applications and Potentials" by E W Scott.

TERTIARY-ALKYL PRIMARY AMINES—*Special Products Dept, Rohm & Haas Co, Washington Sq, Philadelphia 5, Pa*—This new 36-page booklet describes four tertiary-alkyl primary amines. It gives physical and chemical properties, suggested applications and chemical reactions for *t*-butylamine, *t*-octylamine, Primene 81-R and Primene JM-T.

Distinctly different in both physical and chemical properties from straight primary amines, the *t*-alkylamines reportedly show unusual stability to oxidation and form stable derivatives such as aldimines, carbodiimides and *t*-alkyl cyanamides. Physically, they exhibit fluid character and low viscosity over a fairly wide temperature range, improved solubility in petroleum hydrocarbons and improved color stability.

The lower molecular weight *t*-alkylamines, particularly *t*-butylamine, are used principally as chemical intermediates. The higher molecular weight *t*-alkylamines, including *t*-octylamine, Primene 81-R and Primene JM-T, serve in a variety of fields in uses dependent upon their unusual physical and chemical properties.

THERMO ELECTRIC MINIMITE PORTABLE PYROMETER INDICATOR (Bulletin No. 64)—*Thermo Electric Co, Inc, Saddle Brook, NJ*—The MiniMite scale is over 23" long. This small instrument weighs under four lbs and measures approximately 4"x5"x6". Designed as a dual purpose instrument, it can be used to measure temperature directly when connected to a thermocouple, and as a standard comparison instrument against which to check other millivoltmeter and potentiometer-type instruments. Accuracy of this precision, null-balance indicator is said to be ¼ of 1% of scale range. The bulletin contains complete information on specifications, calibrations and the 15-standard, double-range scales available with the MiniMite.

UNITEX—*Latex & Rubber Dept, Stein, Hall & Co, Inc, 285 Madison Ave, New York, NY*—This 20-page booklet covers centrifuged natural hevea latex, which is marketed under the trademark of Unitex. It is a product of Malaya produced in the factories of Guthrie Latex (Export) Limited. and sold exclusively in the United States by Stein Hall.

The booklet contains a complete description of the product, from the planting of the rubber trees to delivery of the latex to consumers. It also gives detailed information on the services offered by Stein Hall and lists the rigid specifications which have been set up for Unitex. Illustrated heavily throughout, the booklet depicts the many steps taken by Stein Hall and Guthrie to insure a high quality latex.

WATER ANALYSIS—*Solvay Process Div, Allied Chemical & Dye Corp, 61 Broadway, New York 6, NY*—Technical and engineering service bulletin #11, comprising 100 pages, is one of the most widely requested in Solvay's entire line. It contains seperate sections on the analysis of several types of waters.

Also included in the bulletin are numerous tables of analytic data, conversion factors and turbidimetric and color standards, and a special section on the preparation of reagents, indicators and standard solutions used in analyses